Improving Healthy Eating in Hong Kong:

A School Based Nutrition Education Model for

Enhancing Healthy Eating Habits in Schools

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Abstract

Background: Recent studies have clearly demonstrated that diet plays a significant role in health promotion and disease prevention. Schools are ideal settings to equip students with healthy eating concepts and related skills at young stage. Since there is no health education subject compulsorily arranged in ordinary secondary schools in Hong Kong, nutrition education is integrated into different subjects such as Home Economics and Biology. A school-based nutrition education model through extra-curricular activity for promoting healthy eating had been designed as a way out of this situation. **Methods:** A quasi-experimental study to develop and test the intervention for promoting adolescents' nutrition knowledge, attitude towards healthy eating, and dietary behaviours. Four secondary schools were randomly assigned into intervention and Control Group. A Health Concerning Club was formed in the intervention schools and 83 students, having a mean age of 13.2, from secondary one to three were recruited. The intervention, lasting for 14 months, included twelve interactive workshops, three publications of newsletter, camping, and school-based health-promoting carnival, while no additional nutrition education besides the formal curriculum was provided for the Control Group. The effectiveness of the intervention was evaluated by self-administered questionnaire at baseline and follow-up. Process evaluations including keeping minutes of meetings, focus group interviews, feedback evaluating survey and so on were carried out for maintenance the intervention, as well as assessing the feasibility of the model. **Results**: Secondary two students showed the overall nutrition knowledge score increased from baseline to follow-up. Males in Intervention Group scored significantly higher marks in nutrition knowledge test at follow-up than those in the Control Group. Although both groups showed significant drop in the mean overall attitude score, Intervention Group remained stable in terms of the proportion of positive students towards healthy eating. For dietary behaviours,

Intervention Group showed increases in consumption of fruit and vegetable, choosing low-fat or fat free milk, and frequency of removing poultry's skin before eating. At follow-up, there were significantly higher proportion of students in Intervention Group who had had breakfast, chose low-fat milk, frequently removed poultry's skin before eating, consumed vegetables and fresh fruit juice for suggested amounts than the Control Group. **Conclusions:** The study suggested an innovative nutrition education model for secondary schools in Hong Kong, which could supplement the existing health curriculum. In order to further promote healthy eating in school, providing a healthy eating environment at both implementation and policy level, as well as strengthening the health elements in existing curriculum are recommended.

Keywords: nutrition education, intervention, Social Cognitive Theory, nutrition knowledge, attitude towards healthy eating, dietary behaviours

改善香港人之飲食健康：一個在學校促進健康飲食習慣的校本營養教育模式

背景：不少研究清楚指出飲食習慣對促進健康及預防疾病有著關鍵的作用。學校是讓學生在年幼時學習健康飲食概念及訓練相關技能的理想地方。由於香港一般中學並沒有設立健康教育一科，有關營養的教育，一般是綜合在不同的學科之中，例如家政及生物等，爲此，一項透過課外活動來推廣健康飲食的校本營養教育模式便應運而生，期望成爲現時健康教育狀況的出路。研究方法：此爲一項類似實驗性的研究，用以發展並測試一項以提高青少年營養知識、對健康飲食的態度及飲食習慣爲目標的介入計劃。四所中學被隨機地分派成爲介入組及對照組。首先在兩所介入組學校中成立「健康關注學會」，並招收八十三名平均年齡爲 13.2 的中一至中三學生成爲會員，然後在學會內推行爲期十四月的介入計劃。計劃內容包括十二節互動工作坊、出版三期會訊、健康生活營及校本性的健康嘉年華；而在對照組，除現有正規課程內的相關教學之外，沒有提供額外的營養教育。學生分別在基線及跟進時填寫問卷，以測試介入計劃的有效性。爲了在推行介入計劃時不斷監察並研究其可行性，研究員在計劃期間不斷進行過程評價，包括編寫會議記錄、小組訪問、回應問卷調查等等。結果：中二級學生的整體營養知識得分在基線及跟進期間上升。在跟進調查中，介入組的男生在營養知識測試的得分明顯比對照組的爲高。雖然兩組的平均整體態度分數均顯著下跌，但若以對健康飲食持正面態度的學生比例來說，介入組的態度仍維持穩定。飲食行爲方面，介入組進食蔬果、選擇低脂或脫脂牛奶及除去不吃家禽的皮之頻率均顯著上升。在跟進調查中發現，介入組有進食早餐、選擇低脂或脫脂牛奶、除去不吃家禽的皮之頻率、進食所建議份量的蔬菜和新鮮果汁的學生比例明顯比對照組高。結論：此研究爲香港中學提供一項創新、而且可以補充現有健康課程的營養教育模式。爲了進一步推廣學校健康飲食，學校更可在政策層面及落實執行層面上提供學生一個健康飲食環境，以及強化現有課程上的健康元素。

要詞：營養教育、介入、社會認知理論、營養知識、對健康飲食之態度、飲食習慣

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Chapter one: Introduction and reviews of the literature

1.1 Introduction

An ordinary secondary school in Hong Kong usually has more than twenty clubs for students to join, types including academic, sport training, social service, and recreational and so on. No matter which club you had joined in your school life, I think you did enjoy the wonderful time that a group of friends gathering together with the same missions that committed for. I did so and I had a dream to teach or advocate something special or beyond the syllabuses in school since my graduation from secondary school. The idea had become clear when I recognised in my undergraduate study about the importance of maintaining a healthy lifestyle, in especially the consequences of healthy eating. I then planned to initiate a study to prove the effectiveness of promoting healthy eating through an extra-curricular approach.

Healthy eating is not a simple topic, because food is associated with more than just satisfying hunger. Food may be used as a reward, as a way to deal with problems and an important part of social interactions. For most adolescents in Hong Kong, eating well is not as difficult as in the past because abundance of food is available in the market. However, the abundance of food with limited nutritional value may distract people from more nutritious choices. The skills to make healthy nutritional decisions become critical for adolescents, from deciding whether to have breakfast or not to choosing low-fat food with the nutrition fact on different food products. Being a health educator, I had worked with a group of junior secondary students for fourteen months to advocate healthy eating among their community in school. Different strategies and theory of health promotion had been adopted in the programme called "Health Concerning Club" programme. With increased

knowledge and skills, members of the Club became able to grasp and consolidate the concept of healthy eating and use it to improve their health.

The purposes of this thesis are to prove the effectiveness of the "Health Concerning Club" programme in improving the members' nutrition knowledge, attitudes towards healthy eating, and eating behaviours, as well as to discover the acceptability of a "Health Concerning Club" in school and the factors needed to be considered when implementing the model/ intervention.

In this chapter, I will show you evidence why teaching about healthy eating for adolescents in Hong Kong is important, and state objectives and hypothesis of the study based on literature reviews. In chapter two, I will describe the framework of the intervention study, stages of development of the intervention programme, and evolution of the evaluation tool used. In chapter three, I will clearly show the results of baseline and follow-up assessments, as well as the changes between the two assessments. Findings of the process evaluation will be presented at design and output levels, too. Reflective and insightful views of nutrition and health promotion from the results of the study will be presented in the Discussion Chapter, before coming to conclusions. This thesis will give readers, especially those who are interested in health promotion for students, insights and encouragement because it will provide an innovative model of promoting healthy eating for adolescents based on an intervention research and abundance of evidence.

1.2 Nutrition and Health

Many recent studies have clearly demonstrated that diet plays a significant role in health promotion and disease prevention (National Research Council, 1989; US Department of Health and Human Services, 1991). Unhealthy eating patterns can cause immediate effects such as under-nourishment, iron deficiency anaemia, overweight and obesity. Chronically undernourished children can have adverse effects on their cognitive development and are more likely to become sick, to miss school, and to fall behind in class (Center on Hunger, Poverty and Nutrition Policy, 1995; Hinton *et al.*, 1990; Troccoli, 1993). Several studies also suggested that skipping breakfast could adversely affect children's intellectual performance (Pollitt *et al.*, 1981; 1983 & 1995). About one-sixth of the adolescents in Hong Kong did not have the habit of having breakfast (Cheung, 1998; Lee *et al.*, 1999). Female adolescents are at greatest risk for iron deficiency, which can increase fatigue, reduce resistance to infection and impair intellectual performance (Public Health Service, 1988; Pollitt, 1993).

Poor eating habits and inactivity are the crucial causes of overweight and obesity. Young obese people are associated with elevated blood cholesterol levels (Kikuchi *et al.*, 1992; Freedman *et al.*, 1985; Resnicow and Morabia, 1990) high blood pressure (Clarke *et al.*, 1986; Shear *et al.*, 1987), respiratory disorders, orthopaedic conditions, and hyperinsulinaemia (Dietze, 1981). Persistence of childhood obesity into adulthood has also increased the risk of adult mortality and morbidities such as coronary heart disease, cancer, stroke, diabetes and osteoporosis etc. (Must *et al.*, 1992; Nieto *et al.*, 1992; Public Health Service, 1988; Doll and Peto, 1981; Doll, 1992; American Heart Association, 1994; Sandler *et al.*, 1985; Sentipal *et al.*, 1991). A study in 1993 showed that the obesity rate of Hong Kong boys aged from 6 to 18 is 13.4%, while the rate for girls at that age is 10.5% (Leung, 1995).

While many adolescents do not have good eating habits, the emphasis on thinness becomes more prevalent in Hong Kong. Another survey on Eating Behaviour and Body Image of Hong Kong female adolescents showed that 84 % of the respondents were not satisfied with their body weight and body shape; 13% of them who were already underweight still wanted to lose weight (Leung, 1999). The common methods used for losing weight were doing exercise (48.7 %), dieting or fasting (28.3%), induced vomiting after meals (3.3%). The school children should learn about the dangers of unsafe weight-loss methods and the risk of developing anorexia nervosa and bulimia nervosa, since their expected 'ideal' body weights were far below the normal healthy weight (Pang, 1997).

1.3 Eating behaviours of Hong Kong adolescents

Leung *et al.* and Cheung did research on Hong Kong adolescents' dietary practice in 1993 and 1997 respectively. Both studies involved subjects from one or two clusters, and may not be absolutely representative of the teenage population in Hong Kong. However, due to the lack of large-scale dietary survey, these two studies do indicate to some extent the eating behaviour of the teenagers in Hong Kong. In general, a high intake of meat, cholesterol, and a low consumption of vegetables and fruits, unrefined grains were observed among Hong Kong adolescents.

Lee *et al.* did a cross-sectional survey on Health Risk Behaviours of Hong Kong adolescents in 1999, in which 26111 students (aged from 10 to 19) from 48 primary and secondary schools territory-wide joined in the survey (Lee *et al.*, 1999). Dietary behaviours of the seven days preceding the survey showed following findings: (1) 20.6% of the subjects did not have the habit of having breakfast; (2) 55% of the respondents had drunk sugary product; (3) 14% of them had eaten fried

food more than once per day; (4) 3.2% of them had not taken any green vegetables; and (5) 18% of them had eaten desserts or snacks more than once per day.

1.4 School-based Nutrition Education

Adolescents need nutrition education to help them to develop lifelong healthy eating habits consistent with the dietary recommendations for Chinese and the Food Guide Pyramid. As indicated by some health education experts in Unites States, school children may be familiar with the relationship between nutrition and health but are less aware of the relationship between specific foods and health and cannot use their knowledge to make healthy food choices (Murphy, 1994; Story, 1986). Similar problem may be faced by students in Hong Kong.

Schools are ideal settings for nutrition education since schools can reach almost all children and adolescent and provide a site where interventions can efficiently and economically be implemented. Also, school children have the opportunities to practice healthy eating and learn how to resist peer pressures to change their eating behaviours.

Many young people often decide what to eat with little adult supervision nowadays (Crockett, 1995). Fast food shops and convenient shops become more available and the growth in the number of one-parent families or families having two working parents in Hong Kong have compounded the problem. These enhance the importance of nutrition education in schools. Lytle *et al.* (2000) found that as students moved from primary to secondary school, their consumption of breakfast (from 99% at primary three to 85% at secondary two), fruits, vegetables, and milk decreased; but soft drink consumption increased. Such findings raised the importance of nutrition education in the primary and junior secondary school years.

School based nutrition education programmes have been found effective in improving the eating behaviours of school children in other countries (Contento, 1995a; Lytle, 1995). However, nutrition education in schools may not achieve the goal of improving students' eating pattern when others such as families, restaurants, food stores, community centres, government programmes, and the media are not supportive. The situation is similar in most of the schools in Hong Kong.

1.5 Nutrition education in Hong Kong

Health education is not taught as a separate subject in Hong Kong primary and secondary schools. Following the education system of England, secondary schools in Hong Kong offer some form of health education, including healthy eating, at some point in the school life of their pupils. The range of methods used varies from a "health education week" for fifth forms, to a coordinated core programme of health education to all pupils from secondary one to seven. Units of workshops in health education are usually integrated into other subjects such as general studies, home economics, arts, music, science, and physical education throughout primary and secondary education (Curriculum Development Council, 2000). Table 1.1 summarises the topics related to food and nutrition taught in primary and junior secondary in Hong Kong and Taiwan, whose health education is developed with a longer history and has similar culture to Hong Kong.

Table 1.1 Food and Nutrition Category in Health Education Curriculum in Taiwan and relevant topics in different subjects in Hong Kong

Grade	Topics on food and nutrition	
	Taiwan	Hong Kong
Primary 1 (at about age six)	Relationship between food and health and growth The importance of having breakfast Willing to try different foods Healthy snacks	
Primary 2	Basic healthy eating habits Table manners	**General Studies:** Functions of food Food's categories Eating habits Food hygiene
Primary 3	Knowing the six food groups Importance of water	
Primary 4	Relationship between food and energy Health problems due to malnutrition Low sugar, salt, fat and high fibre diet	**General Studies:** Five nutrients Water and fibre Digestion of food Balanced diet Food hygiene
Primary 5	Food hygiene which prevent food poisoning Concerns of the diet in puberty	
Primary 6	Food preservation Healthy food choices when eating out	
Secondary 1 (at about age twelve)	Food nutrients (carbohydrates, fat, protein, minerals, vitamins and water) Evaluate personal nutrients needs in puberty	**Social Studies:** Balanced diet and food hygiene[#] **Home Economics:** Functions of food[#] Relationship between food and nutrients Food's categories[#] Water[#] Dietary fibre[#] Balanced diet[#] Skills of preparing and cooking food Simple meal planning
Secondary 2	Food additives Nutrition value of the enriched foods and food additives Methods of controlling sugar, salt, fat and cholesterol intake (in related to the control of chronic diseases) Cooking a simple breakfast Meal planning based on healthy eating concepts	**Home Economics:** Knowing the nutrients Balanced diet[#] Skills of preparing and cooking food Food preservation Simple meal planning[#]
Secondary 3	Calorie and physical activity Unhealthy diets Weight control	**Home Economics:** Knowing the nutrients[#] Balanced diet[#] Eating disorder and related diseases Frequently eaten foods Skills of preparing and cooking food Food preservation[#] Meal planning **Integrated Sciences:** Food substances Functions of food Balanced diet

[#] *Topics which appear more than once in the curriculum*

Sources compiled from:

Curriculum development council. Syllabus for secondary schools: General Studies (primary 1-6), 1997.

Curriculum development council. Syllabus for secondary schools: Integrated Sciences (secondary 1-3), 1998.

Curriculum development council. Syllabus for secondary schools: Home Economics (secondary 1-5), 1994.

Curriculum development council. Syllabus for secondary schools: Social Studies (secondary 1-3), 1997.

Zhen Yuen Ling, Li Yi Yao, Xu Xiu Hua. A compendium of the 1st-9th grades health curriculum, 1999.

Actually, no matter how health education, including nutrition, is taught as a subject/ course or cross-curricular coordinated programme, both strategies have their own pros and cons. For instance, when health is taught as a subject or course, it is given specific curriculum time and there will be a small group of teachers teaching it who have built up a dossier of tried and tested materials; however, the disadvantage is that health education will be seen in too narrow a light or isolated and does not involve the whole school. On the other hand, coordinated programme across the curriculum is an ideal way of developing health education, because of the spread of interests involved through the involvement of one or two key subjects (Health Education Authority, 1992). Good coordination, however, is required when implementing it. In comparison with Taiwan, Hong Kong's food and nutrition education could be reviewed in three ways. The condition of Hong Kong is that the nutrition topics are taught in different episodes in different subjects. Although there are advantages of placing health education as a cross-curricular issue, some topics such as balanced diet and food hygiene are duplicated throughout the curriculum. It could become more emphasised and systematic when topic pieces are integrated into one subject. Secondly, there is no nutrition education in grade one, three, five and six, showing that the education is not continual and sequential which is a key element for successful health education (Dixey *et al.*, 1999). Finally, a well developed curriculum provides age-appropriate learning experiences relevant to their health concerns, but Hong Kong's syllabuses seem to miss some student-centred nutrition topics such as weight control, methods of reducing fat and sugar intake, evaluation of personal nutrient needs. Such topics may be essential to equip students with personal health skills applicable to their age and culture.

Another review on health education in Hong Kong (Pang, 1997) also indicated that adolescents nowadays paid concern to new trends—weight-loss or keeping fit, skin care and slim figures. Their interests are extending beyond the focus of

conventional health education.

In school, classroom lessons alone might not be adequate to influence long-lasting changes in students' eating behaviours (SNE, 1995). They need access to healthy food and the support from others, too (Contento, 1995b). One study on the significance of intervention health education programme (peer-to-peer communication) and non-intervention health education programme (lecture format or teacher-to-students communication) showed that intervention programme are statistically superior to non-intervention one (Black, 1998). Extra-curricular activity is considered to be a good mode to conduct intervention programme in schools, which is also advocated by the Curriculum Development Council of Hong Kong (2001) to educate health topics.

1.6 Health behaviour theories/ models

In the last twenty years, a number of different models and theories have been developed to provide applicable constructs for people to plan effective health programmes. Four of the theories and models are selected and briefly described because they are commonly and frequently used in health promoting interventions. These include the Social Cognitive Theory, the Health Belief Model, the Theory of Planned Behaviour, and the PRECEDE-PROCEED model.

The Social Cognitive Theory is currently the leading theory influencing health education planning (Ellis, 1999). It emphasises three interacting sets of determinants of health-related behaviour: (1) personal factors, such as knowledge about health, expectations of outcomes, self-efficacy (confidence in one's ability to practice a behaviour), value placed on health, body image and other beliefs; (2) behavioural factors, such as interpersonal skills, intentions to act, incentives and

reinforcement; and (3) environmental factors, such as parental support and role models, peer pressure, cultural norms and expectations, community opportunities and barriers such as time and cost (Bandura, 1986).

The Health Belief Model claims that an individual's willingness to behave in a healthy way depends on his or her sense of vulnerability to a health problem. Vulnerability is influenced by the perceived seriousness of the health consequences and the belief that personal actions place one at risk (susceptibility). Individuals also weigh barriers or costs against benefits when deciding about practicing health behaviour (Rosenstock, 1988).

The Theory of Planned Behaviour emphasises the individual cognitive factors affecting health-related decisions. It postulates that behavioural intention predicts the practice of a desired behaviour. Behavioural intent in turn is influenced by perception of social and family norms, the desire to comply with these norms, analysis of the consequences of a behaviour and confidence in the ability to practice behaviour (Ajzen, 1991).

The PRECEDE-PROCEED model, consisting of nine phases, is a conceptual framework for a quality health intervention planning rather than a single theory of explaining behaviours. PRECEDE involves series of diagnoses of health and related factors (including predisposing, reinforcing, and enabling factors) at five individual levels. Whereas, PROCEED emphasises another diagnostic or evaluation process which highlights the importance of environmental factors, such as industry, the media politics, and social inequities (Glanz *et al.*, 1996).

1.7 Lessons learned from other interventions

To commence with, Potter *et al.* (2000) reported the changes in randomized trails in the "5 A Day for Better Health Program" to promote the message of eating five or more servings of vegetables and fruit daily for better health, in which the average effect increase was 0.62 servings per day. The report showed that it is possible to change the school environment and to reinforce the healthy dietary practices taught through the classroom curricula. In one the trials, Domel *et al.* (1993) had carried out a "Gimme-5" curriculum of 18 sessions over six weeks in Georgia of United States. The curriculum was designed to change the students' environment and equip 195 students (aged 9-11) with skills in requesting more fruits and vegetables at school and home. Methods used to change behaviour were goal-setting, problem solving and social support, while the teaching methods included games, role-playing and newsletter for parents. Fruit consumption increased by 50% in the Intervention Group compared with 17% in the Control Group, but consumption was still less than one serving per day. Nutritional knowledge and preferences for fruit and vegetable snacks also increased. The authors suggested that more intensive efforts might be necessary to change practices in the home.

Hopper *et al.* (1992) did an intervention on diet and exercise in an elementary school in California. Three classes were randomly assigned into "school only group", "school and home group" and Control Group. Some other reviewers on Hopper *et al.*'s study noted that it is a poor quality evaluation of a reasonable quality intervention, which suffered from inadequate analysis and reporting of results (Roe *et al.*, 1997). Lesson learned was that the unit of randomisation used in this study was the class but the unit of analysis is the individual, leading to a selection bias, which should be prevented.

Killen *et al.* (1988) did an intervention targeting on cardiovascular risk factors in California, which had successfully improved the Intervention Group's snack food choice, and nutrition knowledge in compared with the controls. Since the pre-and-post intervention measures showed a mean of less than half of the correct responses, lesson learned was that the level of difficulty of the knowledge assessment tool should be validated before used in order not to provide test to students that is too difficult.

King *et al.* (1988) ran a school-based dietary change programme of five sessions over three weeks (50-minutes per session) in California. Within the 218 tenth-grade students, only 48% of them completed both the baseline and immediate follow-up assessments; 25% completed a one-year follow-up assessment, too. Such a high non-response rate should be prevented in a programme in order to obtain meaningful data for analysis. Lesson learned was the importance of ensuring students' participation of the assessments.

Luepker *et al.* (1996) ran the largest scale and well-documented programme on students in United States, named Child and Adolescent Trial for Cardiovascular Health (CATCH). It was a three-year-randomised-trail of 56 intervention schools and 40 control schools in United States targeted at more than five thousands students in grade three, four, and five. The programme focused on physical activity and diet (reducing fat, saturated fat, and sodium intake). Fifteen to 24 lessons targeted specific psychosocial factors and involved skills development on physical activity patterns and eating behaviours. There were four sessions on smoking prevention in grade five, too. A physical education intervention was accomplished to ensure 40% of time spent on moderate to vigorous exercise in physical education classes. Half of the intervention schools were randomised to receive family intervention consisting of 19 family activity packets throughout the study. Finally, a food

service intervention in school lunches aimed to reduce fat (to 30% of energy) and sodium, in which the food service workers were trained and reinforced. This large intervention was successful in improving eating and physical activity behaviours in children during three school years, although other measures like body mass index and blood cholesterol did not show significant changes. The writer concluded that the policies and practices of schools could be changed without additional new school resources and time through such programme. A follow-up study (Dwyer *et al.,* 2001) found that the students still consumed significantly lower percentages of energy from saturated fat and total fat, higher percentages of energy from total carbohydrates and sugar, and lower amounts of sodium than control students after three years of the intervention; relative risks of cardiovascular disease of the participating children (such as body mass index, skinfold thicknesses and serum lipids) remained stable over a 6-year period (Kelder *et al.,* 2002). When disseminating and adopting of the CATCH in other states or cities, the classroom curricula was difficult to be adopted in schools without school policy emphases regarding health education. Innovative programmes, teacher trainings, ongoing support and networking were essential in spreading health programmes (Hoelscher *et al.,* 2001).

Perry *et al.* (1987) ran a programme named "Slice of Life programme" on diet and physical activity targeted at 170 ninth- and tenth-grade students in a high school in the Midwestern of United States. Intervention classes participated in a ten-session curriculum on diet and fitness adopting Social Learning Theory. Methods included videos, discussions, small group projects, self-monitoring and goal setting, analysis of social and environmental influences. Trained classroom peers led half of the activities. The effectiveness was assessed by pre-and-post questionnaire. Diet was assessed by an eating score based on the number of items usually selected as snacks, breakfast, and restaurant-menu selections, which were heart-healthy. Heart

healthy knowledge and intention was assessed on 18 food pairs. Questions also assessed the likelihood of reading food labels and use of healthy eating skills. Positive changes were reported for females in terms of healthy eating score, intention and knowledge, while males only showed knowledge gain. Several points were learned from this study: (1) peer-led approach adopting Social Learning Theory was workable; (2) females were easier to be motivated and changed than males; and (3) it was possible to assess students' knowledge, intention, and diet by questionnaire provided that the tool is well-validated.

Story *et al.* (2002) described the feasibility of training seventh-grade peer leaders as a component of a school-based nutrition intervention in the Teens Eating for Energy and Nutrition at School (TEENS) study for seventh-graders in Minnesota of United States. Results showed this approach is feasible and had high acceptability among peer leaders, classroom students, and teachers. For instance, almost 90% of the peer leaders reported that they enjoyed being a peer leader. 85% thought they learned more about healthy eating by being a peer leader, and two-thirds thought they ate healthier because they were a peer leader. Other researchers of the TEENS study also evaluated the association of school food environment with dietary behaviours of adolescent, and recommended school-based nutrition programmes to target school-level environmental factors such as food selling in the canteen and vending machine (Kubik *et al.*, 2003).

Resnicow *et al.* (1992) did a cohort study named "Know Your Body programme" of five elementary schools in Texas of United States. Grade one to four students from three of the schools participated in a classroom curriculum of at least 30-45 minutes weekly throughout the school year on diet, exercise, and smoking. Results showed a reduction of 3% blood cholesterol in intervention schools, versus a 1.5% increase in controls after two years. Programme effects were related to degree of teacher

implementation, a predetermined outcome variable. The lesson learned was the importance of a theory-based (Social Learning Theory and the PRECEDE implementation model had been adopted in the programme) health education curriculum with devoted teachers in modelling healthy students.

Roe *et al.* reviewed 76 healthy eating interventions (which were published over the world from 1985 to 1996). The reviewed studies were in the settings of schools, workplaces, primary care, and the community for adults, adolescents, or school-aged children. Studies with the most sustained effect on diet-related outcomes tended to have the following characteristics (Roe *et al.*, 1997):

- A content which focused on diet only or diet and exercise,
- An intervention model incorporating behavioural theories and goals rather than providing information only (the most frequently used theory was Social Cognitive Theory),
- Methods emphasising personal contact and active involvement with strategies of behavioural change,
- Some degree of personalisation of the intervention to individual characteristics, either by contact with trained personnel or use of individualised printed materials,
- The chance of feedback on individual changes in behaviour and risk factors, and
- Support by family and environment, such as in the catering sector or in policy.

Naidoo and Wills (1998) noted that an effective school-based health education should also:

- Address the needs of young people and start from where they are in terms of knowledge and experience,
- be supported by an institution which itself is health promoting,
- be supported by health promotion in the community in which young people's

health choices are made, and

- be delivered by committed and informed teachers with curriculum time and resources, which reflect its importance.

1.8 Brainstorming the idea of a school-based model to promote healthy eating in secondary school

Based on the literature reviews and recognised needs of nutrition education and healthy eating promotion in school, the idea of setting up a club in secondary schools to advocate healthy eating to the members was conceived. Cullen *et al.* (1997) found girl scouting (as an extra-curricular student society) was an effective channel for nutrition education. Baranowski *et al.* (2002) also effectively improved boy scouts' consumption of fruit, fruit juice and vegetable in a three-month intervention. These studies further supported the initiated approach. When considering possible educational strategies to be adopted in this intervention model, some constructs of the Social Cognitive Theory and recommendations suggested by World Health Organisation (1998) had been used. These include: (1) let students plan, prepare healthy meals, and modify recipes practically; (2) let them choose healthy food from tuck shop and restaurants; (3) identify reinforcements for their achievement; (4) have students evaluate media and social inducements, and the strategies to respond; (5) have students analyse environment barriers to healthy eating and the tactics to overcome them; (6) let students encourage parents about healthy living; (7) teach students to record and compare their diets with the standards in dietary guidelines and food guide pyramid; (8) have students set goals for healthy changes in eating; and (9) teach students how to evaluate nutrition claims from advertisements, to enhance behavioural capabilities that will support healthy eating for middle and high school students.

Would this approach be feasible in schools? To answer this question, the researcher did a survey on 152 teachers and counsellors related to school, who attended a health education course. Eighty-four percent of the respondents reported facing "at least some barriers" when implementing health education in their schools. Some barriers included lacking of time or being too busy, lack of consensus with other colleagues, and no support provided by the principal or no supportive school policy. When they were asked about the perceived effectiveness of the proposed model, 76.8% of them perceived that setting up a health club would probably achieve the goal of promoting health in school. The researcher gained lots of support and suggestions from the teachers about how to set up a club and carry out a nutrition education programme in secondary school, and understood that those mentioned barriers might also be encountered when implementing the intervention. Details of the survey are reported in Appendix A.

1.9 Objectives and hypothesis of the study

There were two objectives of this study, which were:

(1) To test the outcome of a nutrition education intervention adopting Social Cognitive Theory on nutrition knowledge, attitudes towards healthy eating and eating behaviours among the participants of a "Health Concerning Club";

(2) To discover the acceptability of a "Health Concerning Club" organised by a peer group in school; and the factors needed to be considered when implementing the model.

The hypothesis was that the activities of the Health Concerning Club would increase the nutrition knowledge, attitude towards healthy eating, and healthy eating behaviours of the adolescents.

Chapter two: Methodology

2.1 Study design

To achieve the objectives of the study, a quasi-experimental design was used. Two groups of school students were chosen for this study: one group had intervention and the other group acted as control. As shown in Figure 2.1, assessments carried out before and after the intervention were compared to indicate the changes through time. The Control Group, without intervention, was important to indicate what happened in absence of the intervention, as well as to detect the change difference between the two groups.

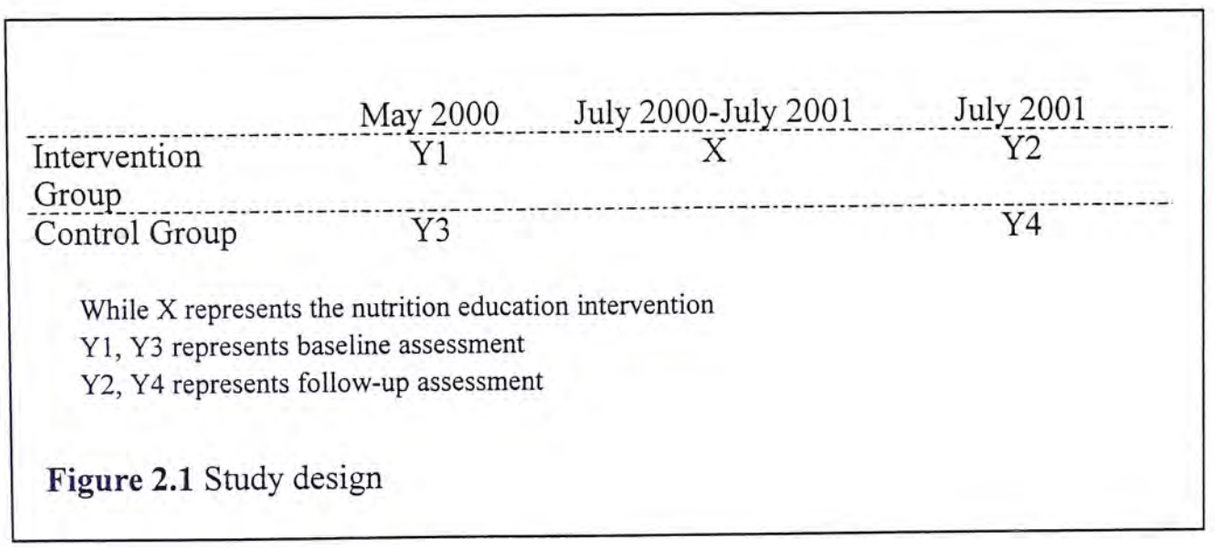

Figure 2.1 Study design

2.1.1 Target participants

Students from secondary one to three, who are about eleven to fourteen years old, were targeted in this study. Teenagers are interested in joining extra-curricular activities and forming club or society in their school life, making the intention of developing a health club feasible. They would be able to cooperate with the researcher to carry out peer-led nutrition education activities and encourage other students to participate, which is a key strategy of the intervention (CDC, 1996). In addition, these students have started to decide on what foods to eat for themselves without adults' advice (especially for lunch) that stresses the importance of

promoting healthy eating concepts for this age.

2.1.2 Sample selection and recruitment

Being an interventional quasi-experiment for adolescents, the study required administration collaboration from the schools. Frequent contact and support would be necessary to ensure smooth running of the programme. Shatin, in the New Territory of Hong Kong, was chosen as sample district of the programme. It was because not only the location was near to the researcher's workplace, but also a wide range of people lives in Shatin from different age groups and social classes. The first step of sample selection was to invite school representatives from all secondary schools in Shatin[1] to a briefing session about the study. Among the interested schools after briefing, four schools having similar social demographic backgrounds such as academic performance and gender of students were recruited and assigned into two groups randomly.

Then, an extra-curricular student club named "Health Concerning Club" was formed in each of the intervention schools. In March 2000, announcement, board display about health messages and the objectives of the club, and some health awareness games were carried out in school to introduce the club to the students. Only junior secondary students, secondary one to three, were eligible to join the club in the first year of formation. During the one-week recruitment period, a total of 83 eligible students from the two intervention schools had joined the membership voluntarily. Consent from students' parents about participating the study had been obtained right away through a reply slip.

[1] In 2000, there are total 46 secondary schools in Shatin, including 3 governmental secondary schools, 38 aided secondary schools, and 5 private secondary schools or other registered school.

2.1.3 Matched control

All students from secondary one to three in the two control schools (n=965) were required to participate at baseline in May 2000 (that is Y3 in Figure 2.1). Students were asked to fill in a self-administered a questionnaire (which will be described in Section 2.4). Fourteen months later, in July 2001, the same group of students (n=936), who had been promoted to secondary two, three, and four, were asked to fill in the questionnaire for the second time (Y4). Since the demographic background of the voluntary members in intervention schools might not be evenly distributed for each grade and gender, matching control was planned to reduce selection bias. According to the pattern of the Intervention Group, corresponding number of student from each grade and gender was randomly picked from the control data set at baseline. The same method of selection was repeated for matching the control at follow-up.

2.2 Study Framework and variables

2.2.1 Independent variable

Figure 2.2 illustrates the framework of study and the relationships between variables involved. The nutrition intervention based on the Social Cognitive Theory was the independent variable of study.

2.2.2 Demographic variables

Basic demographic information of students was obtained from self-administered questionnaire. Gender was grouped as male and female. Grade was categorised into secondary one, two and three according to the baseline data. Students who had been promoted into upper grades after the one-year intervention were still described as the grades at baseline in the Results Chapter, in order to give simplified demographic grouping and results. Parents' educational level was regrouped into

"below secondary" and "secondary or above".

2.2.3 Dependent variables

Nutrition knowledge was one of the dependent variables being measured. The higher the score gained in the test, the better nutrition knowledge the student would have. Attitude towards healthy eating was measured by the degree of agreement towards certain statements. The higher the score, the more positive the attitude the student would have. In addition, the frequency of doing exercise, smoking and drinking alcohol during the two weeks before the survey were recorded. Special eating habit or limitation, such as vegetarian diet and food allergy, was openly asked. These variables were believed to have an interaction with dietary behaviours, nutrition knowledge and attitude.

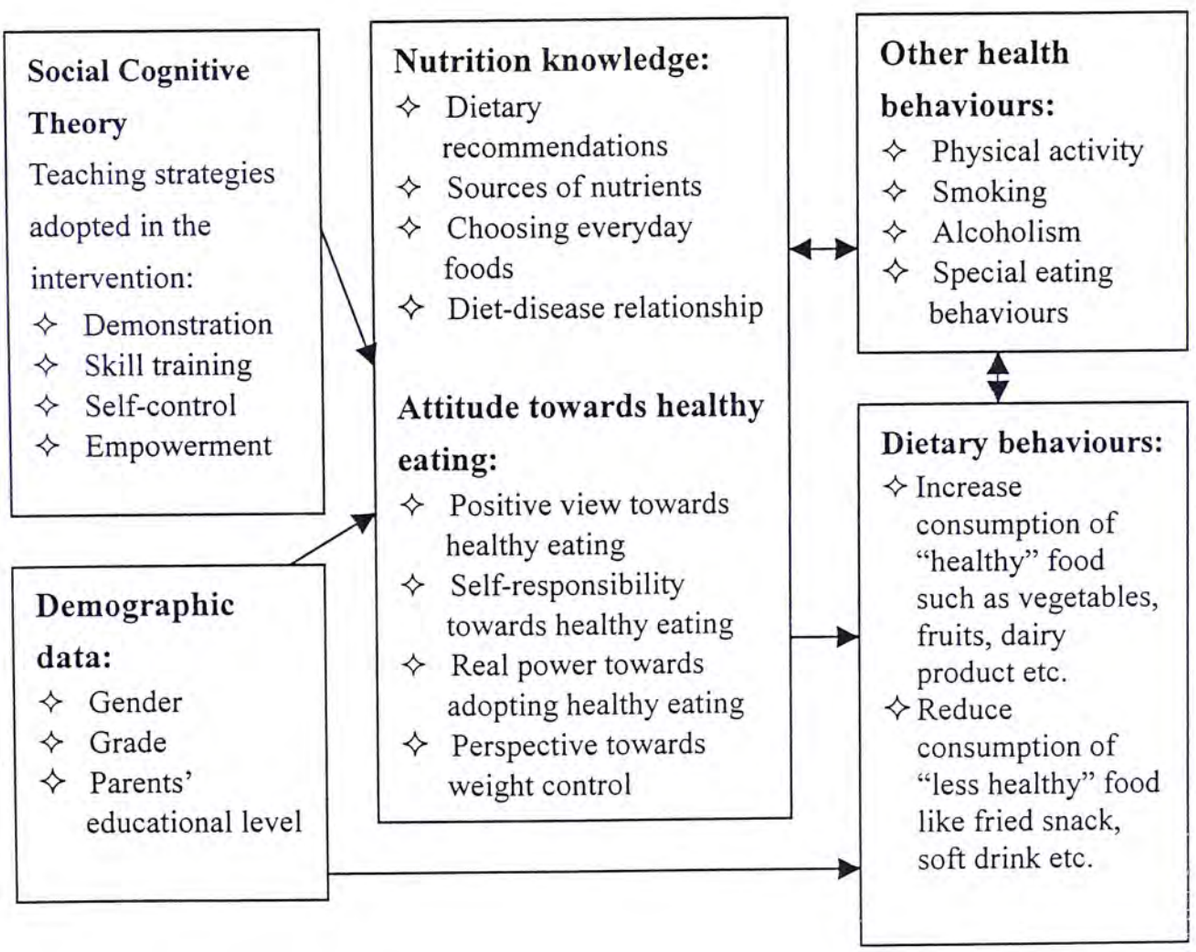

Figure 2.2 Conceptual framework of the intervention

It was assumed that the intervention would alter the students' nutrition knowledge and attitudes, then the dietary behaviours, provided that the effects of the demographic variables and other health behaviours on students' knowledge, attitudes, and behaviours were equal in the two groups.

2.3 Intervention —"Health Concerning Club" programme

2.3.1 Design

Before implementing the programme, the researcher had spent half a year designing the content of the intervention based on the Social Cognitive Theory, promoting strategies suggested by the World Health Organisation, Centre for Disease Control and Prevention, health education syllabuses, and related teaching guides in American, United Kingdom and Taiwan, as well as activities recommended in literatures. The importance of the content on health, adolescents' interest and age-appropriateness were considered, making a balance. For instance, since students' are interested in keeping fit and having fun with cooking, these topics were added into the programme; although the concept of "lifestyle today determines health tomorrow" may not be so attractive for students to grasp, this was also included in the programme because learning to be responsible to our health was so important. Drafted content areas of intervention included (1) basic nutrients needs for people, (2) factors affecting our diet, (3) healthy eating, (4) diet modification, (5) healthy cooking, and (6) healthy weight control.

Soon after formation of the club in May 2000, a committee consisting of ten students was set up in each of the two intervention schools. Planning meetings were held in the summer vacation with the committee and coordinating teachers. Format, schedule and venue of the activities were discussed to match the content, students' preference and interest, as well as administrative reasons of the schools.

The committee initiated an idea of publishing a newsletter on health named "Town of Health" targeted at club members, other students and staff in school. Drafted content of the newsletter included members' sharing, activity review, and question-and-answer section on nutrition issue. This idea was supported by literatures of the positive effects on promoting healthy eating by student newsletter (Birch, 1999; Hosig and Rodibaugh, 1998; Tyrrell and Eyles, 1999). The committee also planned to organise a camp and a school carnival on healthy living. These ideas were supported and put into practice in order to enhance the learning of health concepts and consolidate the mission of disseminating health messages in school.

2.3.2 Implementation

The major part of the intervention was twelve workshops on nutrition education. Contents of the workshops are shown in Table 2.1 and the detailed workshop plan is reported in Appendix B. Workshops were held after-school in activity room of the schools. Intervals between the workshops were varied from two weeks to one month, in order to fit the schooling schedule and prevent arranging activities around the examination period. Workshops usually lasted for one to one-and-a-half hour. The researcher acted as a tutor of the club, responsible for preparing most of the materials used in the workshops, supporting the conduct of activities, ensuring similarity of workshops between schools, and leading preparation and evaluation meetings of the committee; while a coordinating teacher from each intervention school acted as an advisor of the club, responsible for handling administrative issues in school, sitting in the workshops when available, and advising the student committee about how to run a club.

The researcher led the first three workshops in July 2000, letting the members build relationship and consolidate the belief of learning nutrition and health in club activities. When the student committee members were prepared, they tried to lead the remaining nine workshops from September 2000 to July 2001 with assistance from the researcher and coordinating teachers.

Table 2.1 Content of the intervention workshops

Workshop	Content Area	Activity's name	Concept brought to the members	Format	Time (min)
1	Introduct-ion	Survey	Purpose of evaluating the programme	Questionnaire	25
		Thinking About Food	There are myths about eating	Discussion	15
		Nutrition sentence Completing	Eating and nutrition are important to us	Discussion	10
2	Basic Nutrients Needs for People	Chef Cooking	Ice-breaking	Game	10
		BINGO	Ice-breaking	Game	15
		Categories	The six food groups	Game	10
		Fatty Boom-Ba-Latty	Food containing more fat	Worksheet	15
		Eating is blessing	The hazards of modern diet	Video	25
		Food tasting	Food can be tasty and nutritious	Food tasting	10
3		Matching Minerals	Minerals are essential to good health	Card Matching	10
		Super Big TV	Functions and food sources of different nutrients	Guessing game, paragraph making	25
		Reporter	Role and importance of fibre, carbohydrates, protein and water to the body	Reading and reporting articles cooperatively	35
4		Nutrient Catwalk	Different nutrients play different role in maintaining a healthy body	Fashion show	90
5	Factors affecting our diet	Factors influencing eating	Ethic background, economics, convenience, peer influence and personal factors etc. would affect our eating	Discussion and voting game	35
		Eating and Emotion	Emotion would affect eating	Quiz	25
		Mirror, mirror on the wall—what will I be like in 20 years' time?	We can change our health tomorrow if we modify our lifestyle today	Discussion	20
6	Healthy Eating	Healthy Lifestyle	We can follow the Food Guide Pyramid to eat healthily	Video	30
		Making Your Own Food Guide Pyramid		Poster making	40
7		Food cards questionnaire		Worksheet	20
		The Pressure's On!		Card game	35

Continued~

~Continued Table 2.1

Work shop	Content Area	Activity's name	Concept brought to the members	Format	Time (min)
8	Diet modificat -ion	My Favourite Food	The importance to eat a variety of foods from all the food groups to maintain a balanced diet	Worksheet and Discussion	20
		Meal Planning	We can plan menus for various occasions	Discussion Role-play	30
		Do they eat healthily?	Schoolmates' eating habits are not very healthy and can be modified by reducing fat content, increasing fibre and vegetables content etc	Group research project	30
9		Report on the Project "Do they eat healthily?"		Report on the project and discussion	60
10	Weight Control	BMI and BMR	Healthy body weight range for teenagers	Self assessing worksheet	15
		Energy Expenditure	Energy expenditure of different activities	Self assessing worksheet	20
		Hazard of Obesity	Diseases related to overweight	Guessing game	20
		Weight Control Hint	Hints for healthy weight control	Worksheet and discussion	15
11	Healthy Cooking	Recipe raiders	Ingredients chosen and cooking method used are critical in affecting the nutritive value a dish and can be modified to becoming healthier	Discussion	30
		Healthy cooking competition	Cooking can be healthy and funny	Cooking competition	120
12	Evaluation	Health Concerning Club and U!	What we have learned in the programme and evaluation	Drawing, discussion and questionnaire	60

For the newsletter, five committee members were responsible for interviewing, writing articles, drawing artwork and typing. A dietician reviewed the contents; while the researcher, with assistance of publication experts, composed the makeup of the newsletters. Three newsletters had been published in November 2000, April and July 2001 respectively. The two intervention schools received the same newsletters, which would enhance the communication between them. Special nutrition issues included healthy breakfast, food pyramid, fat intake control, healthy cooking, preventing heart disease, and nutrition labelling. Other members took part in the newsletter by contributing articles and comics, as well as sending nutrition enquiries and comments of the newsletter to the committee members responsible for publication. A sample of newsletter is attached in Appendix C.

A two-day camp named "Healthy Living Camp" was held at an outdoor recreation centre in February 2001. Sixty members from the two intervention schools joined the camp. The aims of conducting the camp were not only to improve members' nutrition knowledge and attitude, but also to train up the members with teamwork and communication skills. Activities included "camp fire dancing", "Health drama", orienteering, and team-building activities. For instance, in "Health drama", members learned about healthy body image, healthy weight control, and the importance of physical exercise through role-playing.

In July 2001, a school-based health carnival, having the theme of "Healthy Living", was organised by the members in each intervention school. Models and display boards on healthy eating, physical fitness and anti-smoking were exhibited. The carnival was welcomed for all students, staff, and the community. Club members were responsible for introducing health messages and leading health games.

To conclude, the major characteristic of the intervention is the adoption of the Social Cognitive Theory, and the detailed applications are illustrated in Table 2.2.

2.3.3 Other characteristics of the intervention

- ✧ Health Concerning Club was a student society formally established in school, therefore having the same role, position, and purposes as other extracurricular activities[2];
- ✧ The club had corresponding rights and responsibilities in schools, including utilising school's facilities and resources;
- ✧ Members were grouped into base-groups (four to five in a group). Many

[2] Extra curricular activities in secondary schools having the purposes of enriching students' school life and sense of belonging; enhancing student's leadership role and creative thinking in organising activities; equipping students with self-management and communication skills; broadening students' horizon in academic studies and leisure; and promoting civic and moral education.

activities were conducted in accordance to the base-groups, aiming at enhancing the learning through cooperative tasks (Johnson, 1991); and

✧ The club built members with the image of healthy students in school, and the club also had a mission of promoting health in school.

Table 2.2 Major concepts in Social Cognitive Theory and implications for intervention

Concept	Definition	Factors influencing eating behaviour	Application in the intervention
Environment	Factors physically and socially external to the person	Healthy food availability at home and school	Form social network in the club
Reciprocal determinism	Behaviour changes result from interaction between person and environment; change is bi-directional	Whether they request for healthy food	Encourage student to ask for more healthy food
Behavioural capability	Knowledge and skills about what to do and how to do it to influence behaviour	Knowledge and skills for healthy eating and cooking	✧ Students develop skills to make healthy recipes ✧ Students develop skills to request more healthy food at home and restaurants
Expectations /outcome expectancies	Beliefs about likely results of action	Beliefs about the benefits gained form healthy eating	Students learn the advantages of healthy eating and the consequences of unhealthy eating
Self-control	Personal regulation of goal-directed behaviour or performance	Personal goals or guidelines for healthy eating	Students set goals for healthy eating
Self-efficacy	Self-confidence in ability to take action and persist in action	Self-confidence in ability to perform and persist healthy eating	Students role-play to enhance their confidence to develop healthy eating behaviour
Observation al learning	Beliefs based in observing others like self and/or visible physical results; also called "modelling"	Models having the experiences or motivations of healthy eating	Students share experiences in behavioural changes
Reinforce -ment (rewards and punishment)	Responses to a person's behaviour that increase or decrease the chances of recurrence	Reinforcement and support through the process of developing healthy eating behaviours	Students receive congratulations when achieving goals

(Modified from Glanz K. *et al.*, *Health Behvaior and Health Promotion*, p.157)

2.3.4 Management of the Control Group

The Control Group consisted of students not exposed to the programme and hypothesised to remain unchanged on the outcomes, relative to the Intervention Group. However, it would be difficult to create a perfect Control Group not exposed to the programme because contamination between groups and nutrition education at community level might occur, which were out of the researcher's control. In order to reduce the chance of contamination, clarifications and promises had been discussed with the teachers from the two Control schools about administration at the beginning of the study. Because the two Control schools had no initial plan in promoting healthy eating during the intervention period, after the teachers had understood the role and importance of being the Control Group, they agreed not to organise additional school-based activity on healthy eating other than the formal curriculum during the intervention period. At the same time, the researcher promised the control schools, on behalf of the institution, to provide the intervention programme and other health education resources to them on request after the study period due to the ethic of equal opportunity to receive health education. Phone-interview to the corresponding teachers at the end of the study reviewed the activities held during the study period, assuring the absence of nutrition education programme. Therefore, the Control Group was believed to be valid, and other contaminative nutrition education disseminated from the formal curriculum and the community was assumed to be equal in the intervention and Control Groups.

2.4 Impact evaluation

2.4.1 Development of the questionnaire item pool

In order to measure the impact of the programme, a survey was conducted before and after the programme of the two groups. Nutrition knowledge, attitude and dietary behaviours were the interested parameters. Based on the objectives of the intervention and literature reviews of different nutrition measuring tools, three validated questionnaires used in other studies were adopted and modified for evaluating the intervention in this study.

For measuring the attitude towards healthy eating, one of the sections of the questionnaire "What Students Think About Nutrition" was referred to, which had been used in the "Nutrition for Life" programme for junior high students in New York. Respondents had to respond on a five-point Likert scale (disagree very much, disagree a little, can't decide, agree a little, agree very much). The scale had an internal reliability coefficient (Cronbach's alpha) of 0.77 (Devine, 1992). Out of the 20 items, 13 were adopted for intervention evaluation in this study. Additional three items "I would acquire healthy eating habit", "I can acquire healthy eating habit", and "I am not satisfied with my recent body shape and weight" were developed by the researcher for the programme objectives.

For measuring students' nutrition knowledge, the "Nutrition Knowledge Questionnaire" developed and validated by Parmenter and Wardle (1999) was referred to. The questionnaire, having an internal reliability coefficient (Cronbach's alpha) of 0.97 and a test-retest reliability coefficient (Pearson's correlation) of 0.98, included mainly four sections: dietary recommendations, sources of nutrients, choosing everyday foods, and diet-disease relationship. The formats of questions were multiple choice and short question, giving a total of 110

marks. In the adopting and modifying process, 60 items relevant to the intervention content were selected into the item pool, and some food or dish choices were revised to adapt local cuisine. Some items such as "Which of the following food is rich in iron?" and "Do you think doing three times of exercise a week is a healthy way for reducing weight?" were generated by the researcher for the programme goals too.

For measuring the dietary behaviours, the "Youth Risk Behaviour Survey Questionnaire" used in a survey on adolescences' health risk behaviours in Hong Kong, was referred to (Lee, 2001). There were 18 items on eating behaviours in the referred questionnaire, such as "Where did you usually have you breakfast in the past seven days?", "How many times did you buy food from fast food shop in the past seven days", "Which kind of bread you usually eat?", as well as a semi-quantified food frequency table, consisting of 11 food items. During the modification process, the food frequency table was further elaborated into 21 food items. The serving size of each item was quantified according to Leung *et al.* (1998). Few questions on eating styles and other health related to behaviours were generated, giving a total of 33 behavioural items.

2.4.2 Pilot testing of the preliminary questionnaire

The preliminary questionnaire was pilot-tested with a convenient sample of 119 students from a secondary school. One class of from each grade of secondary one, two, and three was randomly selected to fill in the questionnaire. Half of the respondents were male (50.4%), aged between 12 and 15. Data of the pilot survey were analysed for item difficulty, item discrimination, and internal consistency.

2.4.2.1 Item difficulty of the knowledge section

According to Kline (1993), items are not useful if more than 80% or fewer than 20% of respondents answer them correctly. Among those items of the preliminary questionnaire which did not meet these criteria, 12 of them were therefore rejected, whereas the rest items were retained on the grounds of content validity, that is they were considered to be testing an essential aspect of nutrition knowledge related to the intervention but not covered elsewhere in the questionnaire. Demographic characteristics of the sample and basic results are shown in Appendix F.

2.4.2.2 Item discrimination of the knowledge and attitude section

The ability of each item to discriminate between respondents with different levels of knowledge was measured by correlating the score on each item with the section score, as well as the overall knowledge score. An item-to-subsection-score correlation or item-to-total-score correlation (Pearson's correlation) of 0.2 has been cited as the cut-off point. Items below this cut-off should be discarded due to the poor discriminatory ability (Kline, 1986; Streiner and Norman, 1992). Most of the failed items were deleted except those who were considered particularly important in terms of content validity.

For the attitude section, three of the 16 items could not meet the criteria of 0.2 item-to-total-score correlation. These three items, "I'll worry about the way I eat when I am older", "I used dieting to lose weight in the past year" and "I am not satisfied with my recent body shape and weight", were retained because the concepts were closely related to the intervention. They were modified and retested for item discrimination in the second version, where they met the criteria. For the complete item discrimination analysis of each knowledge and attitude item, please refer to Appendix F.

2.4.2.3 Internal consistency

This was assessed separately for different sections and the minimum requirement for internal consistency has been recommended as 0.7 (Kline, 1993). By using Cronbach's alpha, internal consistency of the attitude section and knowledge section were calculated as 0.82 and 0.69 respectively.

2.4.2.4 Face validity

Face validity is important in guaranteeing the questionnaire appearing to be practical and related to the purpose of the test. Two focus groups were conducted with another group of 16 students from secondary one to three (not participating in the prior pilot test) to test the face validity. Students filled in the questionnaire and discussed with the researcher about their understanding towards each of the items and pointed out the unclear wordings. Revision was made to reduce ambiguity and maximise the clarity of the questions.

Based on the analysis described above, the number of knowledge items was reduced to 41, and that of attitude and behavioural items were remained at 16 and 33 respectively.

2.4.3 Evaluation of reliability of the final questionnaire

2.4.3.1 Subjects and methods

After several revisions, the following step was taken to re-estimate the internal consistency of the final version. Test-retest reliability had to be verified to make sure that the result produced was consistent over time (Streiner and Norman, 1992). Minimum requirements for test-retest reliability and internal consistency were 0.7 in accordance to Kline (1993). Therefore, a convenient sample of 78 students was recruited for pilot test two from a secondary school not participating in the

intervention, control, or previous pilot test.

Two classes of secondary two were arranged to participate in the second pilot. Questionnaires were administered on three separated occasions. Figure 2.3 illustrates the timeframe and sections of questionnaire involved. A complete questionnaire was used in occasion one (Day1 morning), taking approximately 20-25 minutes to complete. Since eating behaviours of the past seven days was expected to be different when asked again on another day, the eating behaviour section was administered again in the same day with a five-hour-interval (Day1 afternoon) for test-retest reliability (Smith *et al.*, 2001). Two weeks later (Day 15), students were asked to fill in the knowledge and attitude sections for the second time. Two weeks was expected to be long enough for participants to have forgotten their original responses, but not sufficiently long for much real change in nutrition knowledge and attitude to be taken place. Students were not aware of the intended second and third administration at the time of the first. Identity card numbers of the students were used to match the three sets of questionnaires.

Data collected from the first administration were analysed for internal reliability, while all the three sets of responses were used to measure test-retest reliability.

	Test	Retest		
Time frame	Day 1 morning	Day 1 afternoon	Day 2-14	Day 15
Section of questionnaire involved	K, A and B	B	--	K and A

while K represents the knowledge section
A represents the attitude section
B represents the dietary behaviour section

Figure 2.3 Time frame and section of questionnaire involved in pilot test 2

2.4.3.2 Demographic result

All 78 participants completed the measure and no mismatch was found. Demographic characteristics of the samples are shown in Table 2.3.

Table2.3 Characteristics of sample in pilot test 2 (n=78)

	n	%
Gender		
Male	41	52.6
Female	37	47.4
Age		
13	47	60.3
14	26	33.3
15	4	5.1
17	1	1.3
Grade		
Secondary 2	78	100.0

2.4.3.3 Internal reliability

Internal reliability of each subsection was established using Cronbach's alpha. Correlations ranged from 0.43 to 0.77, while the overall attitude and knowledge section scored 0.71and 0.84 respectively (see Table 2.4). Since the behavioural section would be analysed and interpreted by individual items rather than a composite score, no Cronbach's alpha could be estimated. Only the test-retest reliability estimation would be performed for the behavioural section.

2.4.3.4 Test-retest reliability

Pearson's correlation was used to assess test-retest reliability attitude and knowledge scores of the first and third sets of data. As shown in Table 2.4, the reliability of most of the subsections was substantial, ranging from 0.482 to 0.829. The overall reliability of attitude and knowledge section were 0.829, 0.789 respectively, meeting the criterion of 0.7.

Table2.4 Internal and test-retest reliability of the attitude and knowledge section of the final questionnaire (n=78)

Subsection (number of items)	Internal reliability (Cronbach's alpha)	Test-retest reliability (Pearson's Correlation)
Positive view towards healthy eating (6)	0.5432	0.756
Self-responsibility towards healthy eating (6)	0.4333	0.661
Real power of acquiring healthy eating habit (2)	0.6692	0.680
Perspective of weight control (2)	0.6238	0.712
Overall attitude towards healthy eating (16)	**0.7073**	**0.829**
Dietary recommendations (6)	0.6335	0.482
Sources of nutrients (19)	0.7719	0.640
Choosing everyday foods (11)	0.7086	0.663
Diet-disease relationship (5)	0.6753	0.576
Overall nutrition knowledge (41)	**0.8389**	**0.789**

Reliability of the behavioural section was assessed by comparing the questionnaires of students who completed the behavioural section twice on the same day. Pearson's correlation, measuring the correspondence between morning and afternoon questionnaire, ranged from 0.37 to 1.00 (median equalled to 0.64). Nineteen of the 31 behavioural items had the correlations for reliability exceeding 0.61, the conventional criterion for substantial agreement (for details, please refer to Table 2.5 and Appendix F). Although the reliability of this section was not very satisfactory, all the tested items were kept in the final version of the questionnaire due to content validity, that is the frequency of eating such types of food and performing related health behaviours of the participants were very important to the programme.

To summarise, through the validation process described above, the final questionnaire was proved to be valid in assessing the attitude towards healthy eating, nutrition knowledge, and eating behaviours of the students. The questionnaire would also become the main tool for evaluating the success of the intervention. A sample of the questionnaire and its translation is attached in Appendix D and E

respectively.

Table2.5 Test-retest reliability of behaviour section of the final questionnaire (n=78)

Behavioural item samples [a]	**Pearson's correlation**
1. Where do you have breakfast mostly during the day?	0.917
2. During the past 7 days, how many times did you drink milk and yoghurt?	0.756
3. During the past 7 days, how many times did you eat fruit?	0.645
4. During the past 7 days, how many times did you consume candy?	0.659
5. During the past 7 days, how many times did you eat fried snacks like chip and french-fried?	0.618
6. Which kind of bread you usually eat?	0.751
7. Which kind of milk you usually drink?	0.853
8. Would you remove the skin of poultry before eating?	0.932
9. How many times per week do you participate in aerobic exercise up to 20 minutes?	0.972

[a] *Total number of behavioural item is 33.*

2.4.4 Data Analysis

Questionnaires collected from the baseline and follow-up surveys were coded and filed. Data were entered into a computer twice and verified for the absence of typing mistakes. SPSS version 9.0 for Windows computer package was used for tabulation and statistical analyses. The dependent variables mentioned were compared for understanding the baseline status of the intervention and Control Group and identifying any key group differences at baseline. Then the changes of the dependent variables from baseline to follow-up of each group were identified. Finally, comparisons of the variables between the two groups at follow-up were done to investigate the final status of the students.

In order to find out significant results of the above comparisons, chi-square test was used for testing the independence of nominal and ordinal variables, such as gender, grade, and food frequency. Independent t-test was used for testing the difference in the means of interval variables, such as knowledge scores of the two genders. Pearson's correlation was used to assess the linear association between two interval

variables, such as attitude score and knowledge score. All differences in results were considered significant at 95% confident level, or the two-sided significance less than 0.05.

2.5 Process Evaluation

Process evaluation is an important element in an intervention research that provides essential data on factors affecting programme implementation. Such measure also bridges the gap between the intervention design and its final outcome (Nicklas, 2000). The researcher wanted to know if the intervention was implemented according to the intended design, and whether the intervention reached the targeted group (Assema *et al*, 1995). Therefore, six methods were designed to evaluate the process of the programme, as shown in Table 2.6.

Table 2.6 Overview of process evaluation methods, research groups and number of response

Method	Research question(s) that the process evaluation method responding	Research group	Number of report, questionnaire or feedback slip
1. Minutes of meetings	✧ What actually occurred at the planning stage of the programme? ✧ What was the opinion of the committee members about the activities? ✧ How satisfied were the participants with the activities? ✧ What were the effects of the activities?	Committee members of the club	20 minutes recorded
2. Progress reports	✧ Were the objectives of each activity achieved? ✧ What actually occurred throughout the programme?	Researcher (as the tutor and observer of the activities)	30 reports written
3. Attendance of each workshop	✧ How many members attended?	Members	68% average attendance
4. Satisfaction question -naire	✧ Evaluation of the activities?	Members	80 questionnaire received
5. Written feedback on newsletter	✧ Reactions and responses to the newsletters?	Readers of the newsletters	10 feedback slips received
6. Focus groups	✧ What did members learn from the programme? ✧ What improvement could be made for future programme? ✧ What level of satisfaction did the participants have with the activities?	Interested members	20 members participated

In each committee meeting, minute were taken by the secretary or an assigned member. The researcher participated in the meetings and reviewed the progress of every item discussed. The researcher also wrote a qualitative progress report (see Appendix H) after each workshop and large-scale activity about things occurred during the activity, members' responses, overall atmosphere, and achievement of intended objectives.

Responsible committee members noted attendance of the members in each workshop. School policy of extra-curricular activity suggested that members who had attended the club activities for more than 70% would receive merits for encouragement. Students unable to attend had to seek permission of absence from the corresponding teacher before the workshop; too many absences might lead to receiving a "fault", or cancelling of membership.

For the sake of quantitative evaluation on the satisfaction of the members with the activities, an additional 11-item section of satisfaction was incorporated into the post-questionnaire. Statements such as "the activities' objectives stated clearly", "I can completely understand the messages disseminated in the activities", and "Leaders of the activities are enthusiastic" were stated and asked for members' agreement in a five-point Likert scale.

The newsletter was evaluated for its acceptance or popularity in school by attaching a feedback form to each newsletter. A mailbox attaching to the club's notice board in school was open for opinion expression.

Finally, a focus group consisting of ten interested members was carried out in each of the intervention schools. Participants drew pictures and wrote about what they

had learned from the programme, what they liked or disliked about the club, and what improvement would be made for future activities.

2.6 Survey Ethics Approval

The study received approval from the Ethics Committee of The Chinese University of Hong Kong in 2000. A copy of the approval letter is attached in Appendix G.

Chapter Three: Results

Findings of the pre-and-post survey and process evaluation are described in this chapter. Demographic data of students and baseline comparisons between intervention and Control Group are presented first. Changes in the nutrition knowledge, attitude towards healthy, and dietary behaviours of each group are then illustrated, followed by group comparisons of the follow-up status and the findings of process evaluation.

Data were also described for gender-specificity and grade-specificity. All grade information described in this chapter referred to students' grade at baseline, although they had been promoted to upper grades at follow-up.

3.1 Demographic data of the participants

Eighty-three students participated in the intervention and completed both the pre-test and post-test questionnaire. Forty-nine of them (59%) were from School A and 34 of them (41%) were from School B. As shown in Table 3.1 and 3.2, the students were aged from 12 to 16, having a mean age of 13.20 (SD $\pm$1.06). There was no significant difference between the mean ages of the two genders (P=0.055). Number of female students (80.7%) was significantly more than male students (19.3%; P<0.001). More than half of the students (54.2%) were from Secondary One, including 75% of the males. Corresponding number of students from each gender and grade were randomly selected from the control set to match the Intervention Group.

Table 3.1 Age and gender distribution of the students in Intervention Group

Age (year old)	Number of students (%)		
	Males	Females	Total
12	8 (50.0)	17 (25.4)	25 (30.1)
13	5 (31.3)	24 (35.8)	29 (34.9)
14	2 (12.5)	15 (22.4)	17 (20.5)
15	1 (6.3)	10 (14.9)	11 (13.3)
16	0 (0.0)	1 (1.5)	1 (1.2)
Total	16 (19.3)	67 (80.7)	83 (100.0)

Table 3.2 Grade and gender distribution of the students in Intervention Group

Grade	Number of students (%)		
	Males	Females	Total
Secondary 1	12 (75.0)	33 (49.3)	45 (54.2)
Secondary 2	3 (18.8)	15 (22.4)	18 (21.7)
Secondary 3	1 (6.3)	19 (28.4)	20 (24.1)
Total	16 (19.3)	67 (80.7)	83 (100.0)

In order to know the characteristics of students' family background, whether living with parents, parents' educational level and occupation were asked at baseline. Result showed that 98.8% of the students lived with both parents, and majority of the parents had secondary education (59.8% of the fathers and 62.7% of the mothers). Parents' occupation was coded according to the occupation classification of the Hong Kong Government (Census and Statistics Department, HKSAR, PRC, 2001). It was found that 34.6%, 21.0% and 16.1% of the fathers were "service workers and shop sales workers", "plant and machine operators and assemblers" and "professionals" respectively; while most of the mothers (77.1%) were housewives. Detailed classification was shown in Table 3.4. Although students in the Control Group were not matched according to parents' characteristics, no significant difference was found between the two groups on the characteristics mentioned above ($P>0.05$).

Table 3.3 Parents' educational level of the students in Intervention Group

Educational level	Number of responses (%)	
	Fathers	Mothers
Primary school	9 (11.0)	15 (18.1)
Secondary school	49 (59.8)	52 (62.7)
University or above	11 (13.4)	7 (8.4)
Don't know	13 (15.9)	9 (10.8)
Total	82	83

Table 3.4 Parents' occupation of the students in Intervention Group

Occupation	Number of responses (%)	
	Fathers	Mothers
Managers and administrators	2 (2.5)	1 (1.2)
Professionals	13 (16.1)	1 (1.2)
Associate professionals	10 (12.4)	0 (0.0)
Service workers and shop sales workers	28 (34.6)	4 (4.8)
Plant and machine operators and assemblers	17 (21.0)	10 (12.0)
Elementary occupations	5 (6.2)	1 (1.2)
Unemployed	4 (4.9)	1 (1.2)
Retired	1 (1.2)	0 (0.0)
Died	1 (1.2)	0 (0.0)
Housewives	N/A	64 (77.1)
Don't know	0 (0.0)	1 (1.2)

In order to understand more about health behaviours other than nutrition, the questionnaire also asked about the frequency of doing aerobic exercise, smoking, drinking alcohol, self-reported height and weight. The mean height and weight of the students in Intervention Group was 157 centimetres (SD±6.39) and 46.0 kilograms (SD±6.27) at baseline respectively. No significant difference was found between intervention and Control Group. As illustrated in Table 3.5, overweight rate of the Intervention Group was 6.3%, which was defined as 120% of the median weight for height or above, using the Hong Kong reference (Leung, 1995). Underweight rate, which was defined as below 80% of the median weight for height, was 5.0% in the Intervention Group and 10.5% in the Control Group. No significant difference was found between groups in terms of the weight standard.

Table 3.5 Weight standard of Intervention Group and Control Group

Weight standard	**Number of students (%)**		**Chi-square**
	Intervention Group	Control Group	***(P*-value)**
Normal weight	71 (88.8)	63 (82.9)	1.710 (0.425)
Underweight	4 (5.0)	8 (10.5)	
Overweight	5 (6.3)	5 (6.6)	

Table 3.6 showed that about half of students in the Intervention Group (48.7%) had participated in exercise for three times or more per week. The rate of smoking, drinking alcohol and having a special diet were not remarkably high and there was

no significant difference between the two groups on weight and behaviours described above.

Table 3.6 Health related behaviours of Intervention Group and Control Group

Behaviours	Number of students		Chi-square	*P*-value
	Intervention	Control		
Participated in aerobic exercise for at least 20 minutes for three times or more per week	38	40	0.058	0.810
Had smoked cigarette in the previous 2 weeks	2	0	2.024	0.155
Had drunk alcohol in the previous 2 weeks	11	6	1.638	0.201
On a special diet [a]	4	7	0.879	0.349

[a] Common reasons of having a special diet were saving money and keeping fit.

3.2 Baseline status and group comparisons

Detailed statistical tables of group comparisons at baseline are stated in Appendix J. Readers may refer to it for particular comparisons of the knowledge or attitude scores and dietary behaviours at the very beginning of the intervention.

3.2.1 Nutrition Knowledge at baseline

The mean knowledge score of the Intervention Group was 26.25 (SD±5.99) at baseline. Students could score the highest percentage of mark from the "Dietary recommendations" subsection (79.2% correct), but the lowest percentage of mark from the "Diet-disease relationship" subsection (47.2% correct) within the four subsections. No significant baseline difference was found between the intervention and Control Group, as the mean differences only ranged from –5.0% to +2.0%.

Within the Intervention Group, the data were also analysed for grade difference and grade specificity. The mean overall knowledge scores of the Secondary one, two, and three students in the Intervention Group were 24.89 (SD±6.96), 26.89

(SD±3.92), and 28.75 (SD±4.23) respectively (see Table 3.8). The three scores were linearly correlated with grade (Pearson's r= 0.271, $P<0.05$). General rules of correlations between 0.1 and 0.3 being weak, between 0.3 and 0.5 being moderate, and 0.5 or greater being strong were followed when interpreting the figures (Valente, 2002). For subsection scores, weak correlation with grade was found in two subsections (r=0.232 for subsection two, $P=0.035$; and r=0.262 for subsection three, $P=0.017$). When the scores of the Intervention Group were compared with the controls, the only grade-specific differences found were in secondary two students' overall knowledge (26.89 for intervention vs. 23.78 for control; t=2.177, $P=0.037$), and especially their knowledge of "Choosing everyday foods" (7.83 for intervention vs. 6.50 for control; t=2.276,$P=0.029$).

When the data were analysed for gender difference and gender specificity, the mean overall knowledge scores of the males and females of the Intervention Group were 26.25 (SD±5.11) and 26.25 (SD±6.22) respectively. No significant difference of the overall score and the subsection scores was found between the two genders. When compared with the controls, the knowledge scores of the Intervention Group (both overall and subsections) were not significantly different for any gender.

3.2.2 Attitude score and group at baseline

The mean attitude score of the Intervention Group was 9.98 (SD±6.96) at baseline. No significant baseline difference of the mean scores was found between the intervention and Control Group, as the mean differences only ranged from +3.3% to +6.3% (see Table J3 of Appendix J).

The attitude scores were further grouped into two categories: (1) positive (for score>1), and (2) neutral or negative (for score≤0). Ninety-two percent of students in the Intervention Group had "positive" overall attitude, in which, the

"Self-responsibility-responsibility towards healthy eating" subsections still had the highest proportion of "positive" students (85%) among the four subsections. No significant baseline difference of the attitude groups was found when compared with the controls.

The mean overall attitude score of secondary one, two, and three in the Intervention Group were 9.13(SD±7.38), 12.67(SD±6.79), and 9.45(SD±5.72) respectively, which were not significantly different. No significant grade difference was found for the subsection attitude scores, too. When the mean attitude scores were tested for grade-specific group difference, secondary two students in the Intervention Group were found to have significantly higher overall attitude score (12.67 vs. 4.83; t=3.55, P=0.001) and two subsection scores than those controls (see Table J5 of Appendix J). On the other hand, no significant group difference of the attitude scores was found for secondary one and three.

The mean overall attitude score of male and female students in the Intervention Group were 12.44 (SD±7.77) and 9.39 (SD±6.68) respectively, which is not significantly different. For the subsection scores, significant gender differences were found in the "Self-responsibility towards healthy eating" subsection (6.19 for male vs. 4.21 for female; t=2.10, P=0.039) and the "Real power of acquiring healthy eating habit" subsection (1.94 for male vs. 0.88 for female; t=2.29 P=0.024). It was found that the mean attitude scores of the male students in Intervention Group were significantly higher than the Control Group in "Sense of responsibility towards healthy eating" (6.19 vs. 3.19; t=2.45, P=0.019) and "Real power of adopting healthy eating" (1.94 vs.0.56; t=2.19, P=0.037). On the other hand, no gender-specific group difference was found for the females in both groups.

3.2.3 Dietary behaviours at baseline

In general, no significant group difference was found when comparing the baseline dietary behaviours between the intervention and Control Group (See Table J7-13 of Appendix J). Brief frequencies and comparisons are illustrated as follows.

The rate of skipping breakfast in the Intervention Group was 8.8%. The rate of the Intervention Group was not significantly different by grade, or by gender. When compared with the controls, no significant difference of the rate of skipping breakfast was found, whenever gender-split or grade-split. For the place of purchasing food, 3.6% and 19.3% of students in the Intervention Group had bought food from street food vendor and fast food shop respectively (for four times or more during the seven days preceding the baseline survey).

For snacking behaviours, the most favourite snacks of the Intervention Group were carbonated/ sugary drinks (45.6%), and candies (40.5%), in which the corresponding percentage of students in the Intervention Group consumed that type of snack for four times in the seven days before the baseline survey. During the mentioned period, 12.5% students in the Intervention Group consumed milk or yoghurt once or more per day; 15.4% of them ate fruits for twice or more per day; and 20.8% of them consumed three or more servings of vegetables per day.

In fact, most of the dietary behaviours of the Intervention Group did not differ by grade or gender; the three exceptions were: (1) consumption of fresh fruit juice/ vegetable juice (0 male vs. 13 females consumed for ≥4 times/week; χ^2=3.952, P=0.047); (2) consumption of other vegetables (53.7%, 17.7%, and 35.0% of the three grades consumed once per day respectively; χ^2=6.845, P=0.033); and (3) total vegetable count (32.5%, 5.9%, and 10.0% of the three grades consumed three or more servings per day respectively; χ^2=7.042, P=0.030). When compared with the

Control Group for each grade and gender, most of the dietary behaviours were not significantly different; the only exception was the consumption of fresh fruit juice/ vegetable juice by the males (0 in intervention vs. 5 in Control Group consuming fruit juice for ≥4 times/week; χ^2=3.952, *P*=0.047).

3.3 Changes from baseline to follow-up

3.3.1 Nutrition knowledge changes

The overall knowledge score of the Intervention Group was increased by 3.85% from baseline to follow-up (see Table 3.7). Percentage changes of the four subsections, ranged from +2.33% to +4.21%, were not significant.

For grade-specific change, secondary two students especially improved in the overall knowledge by 7.44% (26.89 marks at baseline vs. 29.94 marks at follow-up; t=-2.644, *P*=0.012), and the "Source of nutrients" subsection by 8.79% (11.72 marks at baseline vs. 13.39 marks at follow-up; t=-2.237, *P*=0.032). No significant change of the knowledge scores was found in the secondary two students in Control Group.

For gender-specific change, the overall knowledge score of the males and females in Intervention Group was increased by 6.55% and 3.79% respectively, in which both changes were not significant. In Control Group, females also increased their overall nutrition knowledge (+4.55%; not significant); but that of the males had decreased from baseline to follow-up (-5.79%; not significant), particularly in the "Diet-disease relationship" subsection (-18.75%; t=2.427, *P* =0.017).

Table 3.7 Changes in the knowledge scores of the Intervention Group (n=83) and Control Group (n=83) from baseline to follow-up

Subsection (max. score)	Baseline (mean)	Follow-up (mean)	Mean difference	*P*-value (95% CI)
Intervention Group				
1. Dietary recommendations (6)	4.75	4.89	0.14	0.462 (-0.24, 0.52)
2. Sources of nutrients (19)	11.75	12.63	0.88	0.071 (-0.08, 1.84)
3. Choosing everyday foods (11)	7.40	7.83	0.43	0.154 (-0.16, 1.02)
4. Diet-disease relationship (5)	2.36	2.48	0.12	0.489 (-0.22, 0.46)
Overall nutrition knowledge (41)	26.25	27.83	1.58	0.070 (-0.13, 3.28)
Control Group				
1. Dietary recommendations (6)	4.45	4.75	0.30	0.148 (-0.11, 0.71)
2. Sources of nutrients (19)	10.92	11.76	0.84	0.115 (-0.21, 1.89)
3. Choosing everyday foods (11)	7.22	7.36	0.14	0.653 (-0.49,0.78)
4. Diet-disease relationship (5)	2.46	2.22	-0.24	0.187 (-0.60, 0.12)
Overall nutrition knowledge (41)	25.04	26.08	1.04	0.294 (-0.92, 3.01)

3.3.2 Overall attitude changes towards healthy eating

The mean of the overall attitude score of the Intervention Group dropped significantly by 9.60% from baseline to follow-up (t=3.075, P=0.002). That of the controls also dropped by 9.90% (t=2.842, P=0.005). When the score was regrouped into "positive" or "neutral/ negative", the proportion students having "positive" overall attitude in the Intervention Group remained unchanged, while that of the Control Group dropped significantly in the overall attitude score (χ^2=12.37, P<0.001; see Table 3.9).

For grade-specific change, the mean overall attitude score of secondary one students of the Intervention Group dropped significantly by 12.55% (t=2.846, P=0.006), while the changes of secondary two (-5.21%) and secondary three (-5.35%) were not significant. Similar pattern was observed in the Control Group, in which the

secondary one dropped the most significantly (-19.79%; t=4.127, $P<0.001$).

For gender-specific change, the mean overall attitude score of the males and females in Intervention Group dropped significantly by 15.33% (t=2.203, $P=0.039$) for the males and 8.44% (t=2.427, $P=0.017$) for the females. Similar pattern and significance was observed in the Control Group.

3.3.3 Sub-attitude changes

The mean score of the "Positive view towards healthy eating" subsection dropped significantly in Intervention Group by –8.63% (t=2.220, $P=0.028$) and Control Group by –9.54% (t=2.386, $P=0.018$). Both groups showed significant drop in the mean score of two attitude items within this subsection: (1) "I am interested in knowing more about nutrition." (t=3.46, $P=0.001$ for intervention; and t=2.42, $P=0.017$ for control), and (2) "If I am careful about the way I eat now, I will be healthier when I am older." (t=2.42, $P=0.017$ for intervention, and t=3.94, $P<0.001$ for control).

In "Self-responsibility towards healthy eating" subsection, the mean of Intervention Group dropped by -13.45% (t=3.112, $P=0.002$); that of the Control Group also dropped by -11.14% (t=2.447, $P=0.015$). A significant drop of mean item score was found in "I'll worry about the way I eat when I'm older"[3] of the Intervention Group (t=3.227, $P=0.002$); whereas a significant drop mean item score was found in "I would acquire healthy eating habit" of the control (t=3.865, $P<0.001$).

There was no significant change found in "Real power of acquiring healthy eating habit" subsection, neither in the item scores, too.

The drop of the mean score of the last subsection "Perspective of weight control" in Intervention Group (-8.74%) was non-significant, but that of the Control Group

dropped significantly by -16.57% (t=2.331, P=0.021). The mean item score of the "I tried to go on a diet to lose weight in the past year"[3] item was significantly dropped in both groups (t=2.05, P=0.042 for intervention; and t=2.754, P=0.007 for control), particularly the females of the Intervention Group (t=2.672, P=0.008).

In spite of the drops of mean scores, the picture was different when the scores were regrouped into "positive" or "neutral/ negative". Table 3.8 and 3.9 show that the proportion of "positive" students of all the subsections in the intervention remained unchanged, while that of the Control Group dropped significantly in "Positive view towards healthy eating", "Self-responsibility towards healthy eating", and "Perspective of weight control" subsections.

Among the four mentioned attitude items in the Intervention Group (whose means were significantly dropped), the two items "If I am careful about the way I eat now, I will be healthier when I am older" and "I tried to go on a diet to lose weight in the past year" became statistically unchanged in terms of the proportion of "positive" student. In contrast, in addition to the four mentioned attitude items (whose means were significantly dropped) in the Control Group, two other items dropped in the proportion of "positive" student: (1)"Knowing more about the food I eat is eat is important to me" (χ^2=4.08, P=0.043); and (2)"I really don't care what is in the food I eat"[3] (χ^2=5.42, P=0.020).

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[3] The item was scored negatively because of the reverse meaning on healthy eating attitude.

Table 3.8 Changes in attitude group of the ***Intervention Group*** from baseline to follow-up

Attitude group of subsections	No. of students		Chi-square	*P*-value
	Baseline	Follow-up		
1. Positive view towards healthy eating				
Positive	67	59	2.108	0.147
Neutral or Negative	16	24		
2. Self-responsibility towards healthy eating				
Positive	71	68	0.398	0.528
Neutral or Negative	12	15		
3. Real power of acquiring healthy eating habit				
Positive	53	51	0.103	0.748
Neutral or Negative	30	32		
4. Perspective of weight control				
Positive	46	36	2.410	0.121
Neutral or Negative	37	47		
Overall attitude towards healthy eating				
Positive	76	72	0.997	0.318
Neutral or Negative	7	11		

Table 3.9 Changes in the attitude group of the ***Control Group*** from baseline to follow-up

Attitude group of subsections	No. of students		Chi-square	*P*-value
	Baseline	Follow-up		
1. Positive view towards healthy eating				
Positive	65	52	4.893	***0.027***
Neutral or Negative	18	31		
2. Self-responsibility towards healthy eating				
Positive	69	49	11.723	***0.001***
Neutral or Negative	14	34		
3. Real power of acquiring healthy eating habit				
Positive	53	45	1.594	0.207
Neutral or Negative	30	38		
4. Perspective of weight control				
Positive	44	28	6.279	***0.012***
Neutral or Negative	39	55		
Overall attitude towards healthy eating				
Positive	71	51	12.370	***<0.001***
Neutral or Negative	12	32		

3.3.4 Dietary behavioural changes

3.3.4.1 Having breakfast, buying food from street food vendor and fast-food shop

The rate of skipping breakfast of the Intervention Group remained significantly unchanged from baseline to follow-up, whereas that of the Control Group was increased (χ^2=4.11, P=0.043); particularly the females in Control Group (χ^2=4.34, P=0.037). No significant change was found in the purchasing food from street food vendor and fast-food shop in both groups (see Table 3.10).

Table 3.10 Change of selected dietary behaviours of intervention and Control Group from baseline to follow-up

Dietary behaviours of the seven days preceding the survey	No. of students		Chi-square	*P*-value
	Baseline	Follow-up		
Intervention Group				
Breakfast				
Had	73	73	0.225	0.635
Skipped	7	9		
Bought food from street food vendor				
<4 times	80	83	3.055	0.080
4 times or more	3	0		
Bought food from fast-food shop				
<4 times	67	69	0.163	0.687
4 times or more	16	14		
Control Group				
Breakfast				
Had	69	61	4.105	***0.043***
Skipped	11	22		
Bought food from street food vendor				
<4 times	80	80	0.194	0.660
4 times or more	3	2		
Bought food from fast-food shop				
<4 times	68	66	0.155	0.694
4 times or more	15	17		

3.3.4.2 Snacking habits

For snacking habits, there was a significant decrease in the proportion of students in Intervention Group who consumed carbonated/ sugary drinks for four times or more per week from 45.57% at baseline to 24.66% at follow-up (χ^2=7.24, P=0.007), especially for the females, secondary one and two students (χ^2=4.55, P=0.033; χ^2=4.15, P=0.042; and χ^2=4.83, P=0.028 respectively). No significant change in the Control Group was found in having these beverages. No significant change was found for the consumption of Chinese-styles snack, desserts, potato chips or

similar fried snacks, and sausage/ luncheon meat in both groups.

3.3.4.3 Consumption of fruits and vegetables

Based on the general frequency of fruits and vegetables intakes collected by the semi-quantified food frequency table, the general mean intake of total fruit and vegetable count of the Intervention Group was significantly increased from 2.12 servings/day to 2.99 servings/day (t=-2.133, P=0.035), while that change of the Control Group was not significant.

When each frequency of consumption was regrouped into two categories, as listed in Table 3.11, the proportion of students consuming five or more servings of total fruit and vegetable per day, the Intervention Group was found to have increase significantly (P=0.030). In particular the secondary three students (χ^2=5.363, P=0.021). No significant change was found when the data were compared between gender and grade. On the other hand, the Control Group showed a significant increase only in fresh fruit consumption (P=0.026).

Table 3.11 Changes in the consumption of fruits and vegetables between the intervention and Control Group from baseline to follow-up

Food frequency of the seven days preceding the survey	Serving size	No. of students		Chi-square	*P*-value
		Baseline	Follow-up		
Intervention Group					
A. Green vegetable	3/4 bowl				
<1 time per day		22	18	0.246	0.620
≥1 time per day		57	56		
B. Other vegetable	3/4 bowl				
<1 serving per day		46	39	0.913	0.339
≥1 servings per day		32	37		
C. Total vegetable count (A+B)	3/4 bowl				
<3 servings per day		61	48	3.873	***0.049***
≥3 servings per day		16	26		
D. Fruit	1 medium size fruit				
<2 servings per day		66	54	4.116	***0.042***
≥2 servings per day		12	22		
E. Total fruit and vegetable count (C+D)					
<5 servings per day		67	55	4.726	***0.030***
≥5 servings per day		9	19		
Control Group					
F. Green vegetable	3/4 bowl				
<1 time per day		25	28	0.307	0.580
≥1 time per day		58	54		
G. Other vegetable	3/4 bowl				
<1 serving per day		58	58	0.014	0.905
≥1 servings per day		25	24		
H. Total vegetable count (F+G)	3/4 bowl				
<3 servings per day		69	68	0.001	0.972
≥3 servings per day		14	14		
I. Fruit	1 medium size fruit				
<2 servings per day		72	59	4.933	***0.026***
≥2 servings per day		11	22		
J. Total fruit and vegetable count (H+I)					
<5 servings per day		74	68	0.957	0.328
≥5 servings per day		9	13		

3.3.4.4 "Healthy" beverage choices

No significant change in the consumption of fresh fruit juice, soymilk, and milk/yoghurt was found in both intervention and Control Group. The type of milk usually chosen, however, was significantly changed in Intervention Group. Among those who would drink milk (68 students), the proportion of students who would choose low fat or fat free milk, but avoiding whole, full cream or condensed milk

was increased by 29.4% (30 students at baseline vs.50 students at follow-up; χ^2=12.14, P<0.001). Female (P=0.002), secondary one (P=0.030), and secondary two students (P=0.049) of the Intervention Group were specifically found to have changed.

Similar pattern was observed in the Control Group, in which the proportion of students who would choose low fat or fat free milk, but avoiding whole, full cream or condensed milk was increased significantly by 20.5% (χ^2=5.739, P=0.017). Female (P=0.020) and secondary one students (P=0.022) of the Control Group were specifically found to have increased, too.

3.3.4.5 Carbohydrate-rich food's consumption

Rice, noodles, and bread are the staple foods in Hong Kong, providing plenty of carbohydrates and energy to the students. Cereal flakes claimed to give various vitamins, minerals and fibre that are good for students' health, provided that the sugar content not being too high. In this study, as shown in Table 3.12, Intervention Group was found to increase the consumption of rice/ congee/ noodles significantly, resulting in higher proportion of students having these food for four times or more than the controls at follow-up (P=0.039).

For cereal flakes' consumption, the small increase in Intervention Group remained non-significant, but contributed to a difference with controls at follow-up (P=0.030). The consumption of cereal flakes at follow-up was weakly to moderately correlated with fruit, green vegetable, other vegetable, bread and fresh fruit/vegetable juice (Spearman's rho = 0.354, 0.235, 0.235, 0.293 and 0.325 respectively). On the other hand, in the Control Group, no such patterns were found except a special strong correlation of 0.631 between cereal flakes and dairy product consumptions at follow-up.

Table 3.12 Changes of the consumption of food rich in carbohydrates of intervention and Control Group from baseline to follow-up

Food frequency of the seven days preceding the survey	Serving size	No. of students		Chi-square	*P*-value
		Baseline	Follow-up		
Intervention Group					
Rice, congee or noodles	250 ml				
<4 times		12	3	5.480	***0.019***
4 times or more		67	72		
Cereal flakes	30 g				
<4 times		66	59	0.580	0.446
4 times or more		14	17		
Control Group					
Rice, congee or noodles	250 ml				
<4 times		10	11	0.069	0.792
4 times or more		73	71		
Cereal flakes	30 g				
<4 times		73	74	0.223	0.637
4 times or more		10	8		

3.3.4.6 Meat and protein consumption

The consumption of beef/pork/ham, chicken or other poultry, egg, and sausage/luncheon meat remained statistically unchanged from baseline to follow-up in both groups. No gender-specific or grade-specific changes were found too. For the habit of removing poultry's skin before eating, the proportion of students in Intervention Group who always remove skin increased significantly by 15.3% (P=0.041; see Table 3.13), in particularly the secondary three students (+38.4%; χ^2=5.757, P=0.016) and females (+23.1%; χ^2=7.498, P=0.006). On the other hand, no significant change was found in the Control Group.

Table 3.13 Change in removing poultry's skin before eating between Intervention Group and Control Group from baseline to follow-up

Frequency of removing poultry's skin before eating	No. of students		Chi-square	*P*-value
	Baseline	Follow-up		
Intervention Group				
Always	22	34	4.175	***0.041***
Sometimes, seldom or never	59	46		
Control Group				
Always	19	23	0.510	0.475
Sometimes, seldom or never	64	60		

3.4 Follow-up status and group comparisons

3.4.1 Nutrition Knowledge at follow-up

After the one-year intervention, the survey was repeated in the last workshop. Tests and comparisons similar to what had been done for the baseline data were carried out to indicate the status of the students after the intervention. To commence with, the mean nutrition knowledge score of the Intervention Group was 27.83(SD±5.01) at follow-up (see Table 3.14). In comparison with the Control Group, since the mean differences only ranged from –2.3 to –5.2%, no significance was found between the two groups. No significant group difference was found for each knowledge subsection.

Table 3.14 Comparison of follow-up knowledge scores between Intervention Group (n=83) and Control Group (n=83)

Subsection (max. score)	Intervention (mean)	Control (mean)	Mean difference	*P*-value (95% CI)
1. Dietary recommendations (6)	4.89	4.75	-0.14	0.458 (-0.24, 0.52)
2. Sources of nutrients (19)	12.63	11.76	-0.87	0.093 (-0.15, 1.89)
3. Choosing everyday foods (11)	7.83	7.36	-0.47	0.134 (-0.15, 1.08)
4. Diet-disease relationship (5)	2.48	2.22	-0.26	0.159 (-0.11, 0.63)
Overall nutrition knowledge (41)	27.83	26.08	-1.75	0.067 (-0.13, 3.61)

For grade difference and grade specificity, the mean overall knowledge scores of the Secondary one, two, and three students in the Intervention Group were 26.52(SD±5.82), 29.47(SD±3.52), and 29.21(SD±3.58) respectively, which were weakly correlated with grade (r=0.248, *P*=0.027). For subsection scores, moderate correlation with grade was found in two subsections (r=0.343 for subsection one, *P*=0.002; and r=0.345 for subsection four, *P*=0.002). When the scores of the Intervention Group were compared with the controls, the only grade-specific

difference found was in secondary two students' overall knowledge (29.47 for intervention vs. 25.67 for control; t=2.487, *P*=0.019).

Did the nutrition knowledge of the participants differ by gender after the intervention? The mean overall knowledge scores of the male and female students were 28.19(SD±5.92) and 27.74(SD±4.81) respectively, which were not significantly different. In contrast, female students in the Control Group scored significantly higher than that of their male counterparts (21.25±7.93 vs. 27.24±6.21, t=-3.280, *P*=0.002). The gender differences of the Control Group for each subsection are shown in Table 3.15.

When compared with the controls for gender-specific group difference, male students in the Intervention Group scored significantly higher than that of the controls in the overall score and three subsections (see Table 3.16). Female students in the intervention and Control Group, however, were not significantly different in any of the knowledge scores.

Table 3.15 Comparison of follow-up knowledge scores between ***males*** (n=16) and ***females*** (n=67) in ***Control Group***

Subsection (max. score)	Males (mean)	Females (mean)	Mean difference	*P*-value (95% CI)
1. Dietary recommendations (6)	3.81	4.97	1.16	***0.017*** (0.23, 2.08)
2. Sources of nutrients (19)	10.44	12.08	1.64	0.090 (-0.26, 3.54)
3. Choosing everyday foods (11)	5.75	7.75	2.00	***0.002*** (0.78, 3.21)
4. Diet-disease relationship (5)	1.25	2.45	1.20	***<0.001*** (0.56, 1.84)
Overall nutrition knowledge (41)	21.25	27.24	5.99	***0.002*** (2.36, 9.62)

Table 3.16 Comparison of follow-up knowledge scores between ***male students*** in Intervention Group (n=16) and Control Group (n=16)

Subsection (max. score)	Intervention (mean)	Control (mean)	Mean difference	*P*-value (95% CI)
1. Dietary recommendations (6)	4.80	3.81	-0.99	0.096 (-2.05, 0.18)
2. Sources of nutrients (19)	13.87	10.44	-3.43	***0.034*** (-5.64,-0.24)
3. Choosing everyday foods (11)	8.00	5.75	-2.25	***0.030*** (-3.92,-0.21)
4. Diet-disease relationship (5)	2.27	1.11	-1.16	***0.018*** (-1.81,-0.19)
Overall nutrition knowledge (41)	28.93	21.25	-7.68	***0.009*** (-11.99,-1.88)

3.4.2 Attitude score between groups at follow-up

The mean attitude score of the Intervention Group was 6.90 (SD±5.87) at follow-up, which was 21.57% of the maximum score (see Table 3.17). These figures indicated that students had the highest percentage of attitude score from the "Real power of acquiring healthy eating habit" subsection (25.3%), but the lowest percentage of score from the "Perspective of weight control" subsection (13.0%). Since the mean differences between the intervention and Control Group only ranged from –2.0% to 13.3%, no significance was found.

Table 3.17 Comparison of follow-up attitude scores between Intervention Group (n=83) and Control Group (n=83)

Subsection (score range)	Intervention (mean)	Control (mean)	Mean difference	*P*-value (95% CI)
1. Positive view towards healthy eating (-12 to 12)	2.40	1.81	-0.59	0.189 (-1.47, 0.29)
2. Self-responsibility towards healthy eating (-12 to 12)	2.98	2.49	-0.49	0.341 (-1.48, 0.51)
3. Real power of acquiring healthy eating habit (-4 to 4)	1.01	0.93	-0.08	0.729 (-0.56, 0.40)
4. Perspective of weight control (-4 to 4)	0.52	-0.01	-0.53	0.060 (-1.08, 0.02)
Overall attitude towards healthy eating (-32 to 32)	6.90	5.22	-1.68	0.095 (-3.67, 2.94)

For the attitude groups, as shown in Table 3.18, 86.8% students in the Intervention Group had "positive" overall attitude, which was significantly higher than that of the controls (61.5%; $P<0.001$). The "Self-responsibility towards healthy eating" subsection had the highest percentage of "positive" students (81.9%) among the four subsections in the Intervention Group; and the proportion of "positive" students in this subsection was also significantly higher when compared with the controls (59.0%; $P=0.001$). These figures indicated that even though the attitude changes of the intervention during the programme was downward, the attitude status of the Intervention Group at follow-up was still more "positive" than that of the controls.

Table 3.18 Comparison of attitude group between Intervention Group and Control Group at follow-up

Attitude group of subsections	No. of students		Chi-square	*P*-value
	Intervention	Control		
1. Positive view towards healthy eating				
Positive	59	52	1.33	0.248
Neutral or Negative	24	31		
2. Self-responsibility towards healthy eating				
Positive	68	49	10.45	***0.001***
Neutral or Negative	15	34		
3. Real power of acquiring healthy eating habit				
Positive	51	45	0.889	0.346
Neutral or Negative	32	38		
4. Perspective of weight control				
Positive	36	28	1.627	0.202
Neutral or Negative	47	55		
Overall attitude towards healthy eating				
Positive	72	51	13.84	***<0.001***
Neutral or Negative	11	32		

The mean overall attitude scores of the Intervention Group were weakly correlated with grade (r=0.258, $P=0.027$), and the score for the three grades were 4.95 (SD±5.75) for secondary one, 10.68 (SD±4.98) for secondary two, and 7.74 (SD±5.29) for secondary three respectively. Students' grade was also positively

and moderately correlated with the mean score of "Positive view towards healthy eating" (r=0.370, *P*=0.001) and "Self-responsibility towards healthy eating" (r=0.336, *P*=0.002), but negatively and moderately correlated with the mean score of "Perspective of weight control" (r=-0.355, *P*=0.001). The overall attitude score of secondary two students in the Intervention Group was found to be higher than those of the controls (10.68 vs. 6.61, t=2.046, *P*=0.048). A grade-specific difference in subsections occurred in the "Perspective of weight control" (see Table 3.19), in which secondary one and two students in Intervention Group scored significantly higher than the controls, but the pattern in secondary three was just the opposite.

Table 3.19 Comparison of follow-up attitude score of "Perspective of weight control" between Intervention Group and Control Group by grade

Grade (no. of students)	Intervention Group (mean)	Control Group (mean)	Mean difference	*P*-value (95% CI)
Secondary One (45)	0.80	-0.13	-0.93	***0.013*** (-1.66, 0.20)
Secondary Two (18)	1.37	-0.44	-1.81	***0.048*** (-8.11, 0.03)
Secondary Three (20)	-1.11	0.65	1.76	***0.002*** (0.71, 2.80)

There was no significant gender difference between male and female students' mean overall attitude score in the Intervention Group (6.94 for males vs. 6.90 for females). Females scored significantly higher than males in the subsection "Perspective towards weight control" (1.56 for females vs. 0.27 for males; t=2.60, *P*=0.011); no other gender-difference was found for the rest of the three subsections in the Intervention Group. In the Control Group, however, females scored higher than the males in overall attitude (6.03 vs. 1.81; t=-2.214, *P*=0.030) and two of the subsections.

When comparing with the Control Group for gender-specific group difference, male students in the Intervention Group were found to have significantly higher overall

attitude score and the score in "Perspective towards weight control" than the controls (see Table 3.20). On the other hand, no gender-specific difference was found amongst the females.

Table 3.20 Comparison in the follow-up attitude scores of ***male students*** between the Intervention Group (n=16) and Control Group (n=16)

Subsection (score range)	Intervention Group (mean)	Control Group (mean)	Mean difference	P-value (95% CI)
1. Positive view towards healthy eating (-12 to 12)	1.25	0.25	-1.00	0.282 (-2.86, 0.86)
2. Self-responsibility towards healthy eating (-12 to 12)	2.75	0.81	-1.94	0.052 (-3.89, 0.02)
3. Real power of acquiring healthy eating habit (-4 to 4)	1.38	0.81	-0.57	0.366 (-1.81, 0.69)
4. Perspective of weight control (-4 to 4)	1.56	-0.06	-1.62	***0.003*** (-2.65,-0.60)
Overall attitude towards healthy eating (-32 to 32)	6.94	1.81	-5.13	***0.006*** (-8.70,-1.55)

Correlations between Attitude and Knowledge scores

Did the intervention link students' nutrition knowledge with attitude? A correlation of 0.331 was found between overall knowledge and attitude scores of the students after intervention, which was not found at baseline or in Control Group. Table 3.21 shows the detailed inter-scores correlations. Four out of five attitude scores correlated with the overall knowledge score, while only "Positive view towards healthy eating" was found to correlate in the Control Group. On the other side, four out of five knowledge scores were found correlated with the overall attitude score, while no such pattern was found in controls.

Table 3.21 Correlations between knowledge and attitude scores from follow-up data set of the Intervention Group

Knowledge score	**Attitude score** (*Pearson's R*)				
	Positive view	Self-resp onsibility	Real power	Perspective of weight control	**Overall attitude score**
1. Dietary recommendations	0.303	0.246	0.352	N/S	**0.363**
2. Sources of nutrients	N/S[a]	N/S	N/S	N/S	**0.221**
3. Choosing everyday foods	N/S[b]	N/S[c]	N/S	N/S	**0.221**
4. Diet-disease relationship	N/S	0.238	N/S	N/S	**N/S**
Overall knowledge score	**0.250[d]**	**0.265**	**0.227**	**N/S**	**0.331**

Following significant Pearson's correlations were found between corresponding variables from the follow-up data set of ***the Control Group***:
[a] R=0.273 ; [b] R=0.261; [c] R=0.232; [d] R=0.271

3.4.3 Dietary behaviours at follow-up

The rate of skipping breakfast in the Intervention Group was 11.0%, which did not significantly differ by grade or by gender. No correlation between the rate and students' grade was found. All the breakfast skippers in Intervention Group at follow-up (n=9) were found to have low perception towards body image and weight control (in the fourth attitude subsection), making the two variables moderately correlated (r=0.374); while no such correlation was found in the Control Group.

When compared with the controls, the rate of skipping breakfast in Intervention Group was significantly low (see Table 3.22, P=0.011), especially in the secondary two students (5.3% in intervention vs. 38.9% in control; χ^2=6.167, P=0.013) and the females (13.6% in intervention vs. 28.4% in control; χ^2=4.336, P=0.037). All "breakfast skippers" in Control Group (n=22) consumed less than five servings of fruit and vegetable per day, which was significantly different from those students having breakfast (χ^2=5.774, P=0.016). On the contrary, no such difference between skipping breakfast and fruit and vegetable consumption was found in the Intervention Group.

For the rate of purchasing fast food, 16.9% of the Intervention Group had bought fast food for four times or more in the week before, in which there was a significant gender difference (43.8% males vs. 10.5% females; χ^2=10.215, *P*=0.001).

Table 3.22 Comparison of selected dietary behaviours between Intervention Group and Control Group at follow-up

Dietary behaviours of the seven days preceding the survey	No. of students		Chi-square	*P*-value
	Intervention	Control		
Breakfast				
Had	73	61	6.520	***0.011***
Skipped	9	22		
Bought food from street food vendor				
<4 times	83	80	2.049	0.152
4 times or more	0	2		
Bought food from fast-food shop				
<4 times	69	66	0.357	0.550
4 times or more	14	17		

For snacking behaviours, 33.3% students in the Intervention Group ate candies for four times or more during the week before the follow-up survey, making candies the most favourite snack among the listed snacks. Carbonated/ sugary drink was the second highly consumed snack, in which 24.7% students drank this drinks at the mentioned frequency. Table 3.23 shows that there was significantly higher percentage of the Intervention Group who consumed desserts for four times or more in the week before the survey than those controls (*P*=0.022).

Table 3.23 Comparison of the dietary behaviours of "less healthy" food between Intervention Group and Control Group at follow-up

Food frequency of the seven days preceding the survey	Serving size	No. of students		Chi-square	*P*-value
		Intervention	Control		
Candies	3 granules				
<4 times		50	47	1.195	0.274
4 times or more		26	35		
Chinese-styled snacks	25 grams				
<4 times		66	70	0.509	0.476
4 times or more		8	12		
Potato chips or similar snacks	35 grams				
<4 times		65	66	0.265	0.607
4 times or more		11	14		
Desserts	150 grams				
<4 times		63	55	5.222	***0.022***
4 times or more		13	27		
Carbonated or sugary drinks	250-350 millilitres				
<4 times		55	57	0.479	0.489
4 times or more		18	24		
Sausage or luncheon meat	50 grams				
<4 times		59	48	0.260	0.610
4 times or more		14	13		
Butter or margarine	5 grams				
<4 times		64	66	2.057	0.152
4 times or more		8	16		
Salad dressing	5 grams				
<4 times		67	78	0.044	0.834
4 times or more		4	4		

Special correlations between snacking habits and attitude scores were found and shown in Table 3.24. Those students having higher overall attitude score were found to eat potato chips or similar snacks and sugary drinks less frequently in Intervention Group, provided that the correlations were weak. The attitude scores of "Positive view towards healthy eating" and "Sense of self-responsibility" subsections were negatively correlated with some snacking habits at weak to moderate level. These snacking habits, however, did not correlate with the attitude scores of the rest of the subsections.

Table 3.24 Correlations between snacking habits and attitude scores at follow-up

Attitude variable	Variable of snacking habit [a] (*Pearson's R*)						
	Candy	Chinese-styled snacks	Potato chips or similar snacks	Dessert	Carbonated or sugary drinks	Sausage /luncheon meat	Buying fast-food
Intervention Group							
Overall attitude score			-0.293		-0.266		
Positive view towards healthy eating			-0.349		-0.264	-0.279	
Sense of self-responsibility				-0.307			-0.218
Control Group							
Overall attitude score	-0.270					-0.226	-0.264
Positive view towards healthy eating			-0.223				-0.245
Sense of self-responsibility	-0.286	-0.227	-0.221			-0.219	

Note: blanks represent non-significant for correlation<0.2 or approximating significant value > 0.05.
[a] Frequency of snacking behaviours were categorised by <4/week and ≥4/week.

There was also a higher percentage of the Intervention Group who consumed Rice/congee/noodles (P=0.039) and cereal flakes (P=0.030) for four times or more during the week before the survey than the controls (see Table 3.25). The listed dietary behaviours in Table 3.27-3.28 did not differ by gender or grade; and no specific group difference between intervention and Control Group's consumption of these foods was found whenever gender or grade was split.

Table 3.25 Comparison of the consumption of food rich in carbohydrates between Intervention Group and Control Group at follow-up

Food frequency of the seven days preceding the survey	Serving size	No. of students		Chi-square	*P*-value
		Intervention	Control		
Rice, congee or noodles	250 millilitres			4.275	***0.039***
<4 times		3	11		
4 times or more		72	71		
Bread	1 slice			0.472	0.492
<4 times		47	55		
4 times or more		29	27		
Cereal flakes	30 grams			4.711	***0.030***
<4 times		59	74		
4 times or more		17	8		

For the consumption of fruit and vegetables, there was significantly higher proportion of Intervention Group who consumed "other vegetables", such as potato, carrot, legumes and melons, for one or more serving per day (P=0.012), and "green plus other vegetable" for three or more servings per day (P=0.010) than those controls (see Table 3.26). A grade difference was found in Intervention Group's consumption of other vegetable (62.5%, 26.3%, and 37.5% of the three grades who consumed one or more serving per day respectively; χ^2=7.655, P=0.022).

Table 3.26 Comparison of the consumption of fruits and vegetables between Intervention Group and Control Group at follow-up

Food frequency of the seven days preceding the survey	Serving size	No. of students		Chi-square	*P*-value
		Intervention	Control		
A. Green vegetable	3/4 bowl				
<1 time per day		18	28	1.805	0.179
≥1 time per day		56	54		
B. Other vegetable	3/4 bowl				
<1 serving per day		39	58	6.273	***0.012***
≥1 servings per day		37	24		
C. Total vegetable count (A+B)	3/4 bowl				
<3 servings per day		48	68	6.656	***0.010***
≥3 servings per day		26	14		
D. Fruit	1 medium size fruit				
<2 servings per day		54	59	0.062	0.803
≥2 servings per day		22	22		
E. Total fruit and vegetable count (C+D)					
<5 servings per day		55	68	2.187	0.139
≥5 servings per day		19	13		

For the consumption of relatively healthy beverages, there was higher percentage of the Intervention Group who consumed fresh fruit/vegetable juice for four or more times in the week before the survey than the controls (see Table 3.27, P=0.013). When compared with the controls by each grade, there was higher percentage of secondary three students who consumed soymilk for the mentioned frequency (25% intervention vs. 0.0% control; χ^2=5.625, P=0.018).

Table 3.27 Comparison of the consumption of "healthy" beverages between Intervention Group and Control Group at follow-up

Food frequency of the seven days preceding the survey	Serving size	No. of students		Chi-square	*P*-value
		Intervention	Control		
Fresh fruit juice or vegetable juice	250 millilitres				
<4 times		56	73	6.194	***0.013***
4 times or more		20	9		
Milk or yoghurt	250 millilitres				
<1 time per day		65	72	0.178	0.673
1 or more time per day		11	10		
Soya milk	250 millilitres				
<4 times		64	74	1.299	0.254
4 times or more		12	8		

Amongst those students who would drink milk, there was significantly higher percentage of Intervention Group who chose only low-fat or fat-fee milk than those controls (see Table 3.28), in particular for secondary three students (83.3% intervention vs. 41.2% control; χ^2=5.154, *P*=0.023) and females (74.0% intervention vs. 53.7% control; χ^2=4.856, *P*=0.028).

Table 3.28 Comparison of the milk choice between Intervention Group (n=68[a]) and Control Group (n=65) at follow-up

Type of milk usually chose	No. of students		Chi-square	*P*-value
	Intervention	Control		
Low fat or fat-free	18	31	6.432	***0.011***
Whole, chocolate, full cream evaporated or condensed	50	34		

[a] n refers to the number of students who would drink milk.

For the habit of removing poultry's skin before eating, there was significantly higher percentage of Intervention Group always removing the skin than those controls (see Table 3.29), in particular for the secondary three students (68.4% intervention vs. 30.0% control; χ^2=5.757, *P*=0.016) and the females (52.3% intervention vs. 74.6% control; χ^2=7.102, *P*=0.008).

Table 3.29 Comparison of the frequency of removing poultry's skin before eating between Intervention Group and Control Group at follow-up

Frequency of removing poultry's skin before eating	No. of students		Chi-square	*P*-value
	Intervention	Control		
Always	34	23	3.918	***0.048***
Sometimes, seldom or never	46	60		

3.5 Results of Process Evaluation

3.5.1 Design Level: What actually occurred at the design level of the intervention?

More than 25 meetings were held from March 2000 to July 2001 on the intervention design, planning, adjustment and evaluation of the activities. Most of the meetings involved the researcher and the committee members; sometimes the coordinating teachers joined for administrative reasons and contributed to the programme design from teacher and school's point of views. Appointed members or the researcher took the minutes or progress reports of each meeting for reminding issues raised and following-up the progress of implementation. The first kind of meeting related to the intervention was meeting with teachers, including the coordinators and staff responsible for extra-curricular activities in schools. Purposes, objectives and evaluation of the extra-curricular group, responsibilities of teachers and tutor of the activity group, matters concerning an activity group including committee structure, fee and subsidy, facilities, venue for activities and leadership training had been discussed in the planning meeting at the very beginning of the intervention so as to assure the roles and directions of the intervention in schools. Yearly activity plan of the intervention was submitted to school for approval and filing. In the evaluation meeting with teachers after the year of intervention, general difficulties faced when implementing activities in Health Concerning Club as well as other activity groups in schools were being discussed and reported. Examples included committee members lacking in experience, independence and coping skills, lack of preparation and detailed planning, insufficient propaganda of the activities, too few

students to join, and non-interesting activity formats.

The other kind of meeting was meetings with committee members. The ten members from each school contributed to the planning and preparation of the activities. They were cooperative, creative and responsible in general, in which some of them had very good leadership and managing power, but two to three male members were not very cooperative and obedient, needing extra instruction and counselling by coordinating teachers. For preparing each workshop, two to three committee members were allocated to take charge of the flow and material preparation with help from the researcher and they were able to manage the duties properly for most of the time. The three publications of newsletter and organising the camp were good examples. In publishing newsletters, although the health articles were mainly written by the researcher, the publication team (consisting of five members from each school) was able to design questionnaire, conduct survey, perform data entry / general statistical analyses, writing sharing, drawing graphics / comics, and encouraging other members to contribute articles. In organising the camp, the members were capable of leading outdoor activities, collecting correct and updated health information, arrange groupings and flow of activities, deal with disagreements, and bear responsibility.

3.5.2 Design Level: What was the opinion of the members about the intervention?

A survey was done at the beginning of the intervention on what did the members expect to learn from the activities or the club. Table 3.30 lists out the expectations of the members identified in open-ended questions, which were grouped into four areas. Health, nutrition and healthy eating were the two common interests, in which the importance of healthy lifestyle, nutrients and knowledge about food, as well as self-assessment on health were raised. Body image and weight control was another concern that the members would like to learn from the activities. Requests

for cooking competition and outdoor activities, accompanied with gifts and cooperative skills training were pointed out, too. After considering the members' expectations, the committee members had arranged the activities to try to fulfil their needs.

Table 3.30 Expectation of the member to be learned from the activities or the club

Interested area	Question raised
Health and disease	✧ What is the importance of health? ✧ How to prevent "urban diseases"? ✧ How to be taller? ✧ How to be healthy? ✧ What are the consequences of not eating various foods? ✧ Assessment of self-health condition.
Nutrition and healthy eating	✧ What is a balanced diet and healthy eating habit? What is their importance? ✧ How many calories a person need a day? ✧ How many calories are there in a sausage? ✧ How to solve the problem of lacking time in maintaining a healthy lifestyle? ✧ How to read food labels? ✧ I want to know more updated nutrition information.
Body image and weight control	✧ How to control weight? ✧ How to maintain a good body shape? ✧ How to lose weight at a time? ✧ How to gain muscle?
Format of activities and other expectations	✧ I want cooking practice / Health recipe design. ✧ I want outdoor games and visits. ✧ I want to gain cooperative skills. ✧ How can I be a dietician? ✧ I want presents. ✧ I want higher marks in biology.

3.5.3 Output level: Which health activities were organised, how often, how many people participated?

Table 3.31 summarises the activities held by the Health Concerning Club during the intervention period and corresponding participatory rates.

Table 3.31 Overview of activities held by the Health Concerning Club

Date (2000-01)	Activities	Number of participants (Sum of the two schools)
3,4,16,17 Mar	Recruitment health carnival targeted at junior secondary students	About 700
15, 22 May	Workshop 1: introduction	80
26 Jun, 3 Jul	Workshop 2: basic nutrient needs for people	76
5, 10 Jul	Workshop 3: basic nutrient needs for people	58
25 Sep 18 Oct	Workshop 4: basic nutrient needs for people	60
23 Oct 17 Nov	Workshop 5: factors affecting our diet	47
6, 29 Nov	Workshop 6: healthy eating	55
Nov	Newsletter "Town of Health" No.1	500 copies sent to members and other students and staff
4,11 Dec	Workshop 7: healthy eating	55
18 Dec, 21 Feb	Workshop 8: diet modification	48
24,25 Feb	2-day-camp: healthy living camp	57
9,19 Mar	Workshop 9: diet modification	58
11,12 Mar	Open day in one school: health booths	>800
2,20 Apr	Workshop 10: weight control	51
Apr	Newsletter "Town of Health" No.2	500 copies sent to members and other students and staff
4, 14 May	Workshop 11: healthy cooking	78
25, 21 May	Workshop 12: evaluation	55
Jul	Newsletter "Town of Health" No.3	500 copies sent to members and other students and staff
10 Jul	Health carnivals in two schools	83 members and >1000 other students and school staff

Twelve workshops were arranged after school or after-exam period, each lasting for 60-120 minutes depending on the types of activity. The mean attendance rate was 78.1%. Common reasons of applying for leave were attending extra lesson after school or leisure training like painting and playing piano in or outside school. In retrospect, fifty to sixty members attended the workshops regularly and only two members received "fault" in the intervention period because of mischievous behaviours. Several members were nominated for service and leadership award in school because of their devoted contributions to the club. Large-scaled health

promoting activities, which were launched by the members, had attracted more than 2500 persons at different events (in which a certain proportion of participants join more than one event). Sixty members had joined the two-day camp in which they experienced healthy living and communion through intensive and exciting outdoor and indoor activities. Last but not least, 500 copies of each of the three newsletters (consisting of four A3 coloured pages per publication) had been disseminated to all members and staff in the two schools.

3.5.4 Output level: What was the level of satisfaction of the members with the activities, and what were the effects of the activities?

An additional section on students' satisfaction of the activities was compiled into the post-questionnaire for the Intervention Group, and the results as shown in Table 3.32. In general, students were most satisfied with the leaders' enthusiasm, health knowledge and attitude in handling students' enquiries. More than 60% of the students thought that they had enough chances of participation, and the objectives and messages were clear and understandable. About 60% of them felt that the materials were useful and willing to practise health concepts in real life. Half of the students found the activities interesting and achieving the objectives stated, but less than half of them liked the activities formats.

These were valuable findings for evaluating the process and for further development of the intervention. Although the organising committee (including students' representatives) was keen on promoting healthy eating and had tried very hard to organise age-appropriate and multi-strategic activities, it was still hard to motivate students' interest and attitude towards learning nutrition. More time and resources should be spent on exploring students' interest, culture, social environment and expectation, so as to discover the health issues they considered important and health skills they really needed.

Table 3.32 Satisfaction of students in Intervention Group on the activities (n=83)

	Attitude statements towards the activities	% of agree
1.	The leaders are very enthusiastic.	87.4
2.	The leaders are knowledgeable on the topics.	74.1
3.	I had enough chance to participate in the activities.	69.6
4.	Objectives of the activities were clear.	63.8
5.	The leaders are willing to and patient in answering my enquiries.	63.3
6.	I can fully understand the messages disseminated during the activities.	61.3
7.	The materials distributed during activities are useful to me.	60.0
8.	I hope to adopt messages learned from the activities in daily live.	57.6
9.	Objectives of the activities are achieved.	54.4
10.	The activities in Health Concerning Club are interesting.	50.1
11.	I like the formats of the activities.	44.3

In order to understand how the members felt about the intervention, two focus groups, involving a total of 20 voluntary members, had been carried out soon after the intervention. Since it was difficult to invite those frequent absentees to join the focus group, the following illustration would be focused on recommendations for further development but not exploring the reasons of dissatisfaction. During the focus groups, volunteers, shared photos taken in the intervention and drew pictures representing their feelings about health and the programme, followed by group discussion. The pictures and recommendations written were kept and interpreted by the researcher.

Table 3.33 lists some of the highlighted points. Participants identified the most favourite activities to be cooking competition, camping and publishing newsletters. When discussing about areas needing improvements, they suggested arranging members' meetings and questionnaires less frequently, but publishing newsletter more frequently. A committee member expressed that they might not try to mix

"learning" and "playing" together when designing the activities, because it was difficult to pay attention after-school for brain-storming and group discussion; outdoor visits, painting walls and exciting games would be more appropriate and could attract members to join. Other recommendations for formats of activities included teachers-and-students competition, exchange activities, longer camping and healthy-food festival.

Table 3.33 Points raised by the club members in the focus groups (n=20)

Issue discussed	Highlighted point
When drawing feelings about the programme, they said:	✧ "Healthy living is a long way run and I will strive to go." ✧ "The club has given me lots of new knowledge." ✧ "I feel very happy (like sun and flowers)." ✧ "The club is a bridge leading us to health." ✧ "I had grown a lot through the programme. I feel valuable to know other members from other school in the camp." ✧ "Newsletter's content is enriched." ✧ "Cooking competition and the camp are funny and good." ✧ "The 'Nutrient fashion show' is funny and meaningful."
When discussing improvements of the programme, they suggested:	✧ Publishing more newsletters ✧ Arranging fewer member meetings (1 per month would be fine) ✧ Arranging fewer questionnaires and group discussions ✧ Not mixing "learning" and "playing"
When brain-storming recommendations for further development, they suggested the following formats of activities:	✧ Outdoor visits ✧ Competition like posters design ✧ Teachers-and-students competition ✧ Healthy food festival ✧ Distributing health pamphlets ✧ Exchange activities, to know other schools' members ✧ Longer camp (3-4 days) and more frequently (2 per year)

3.5.5 Output level: What else happened after the intervention?

After the 14-month intervention of healthy promotion, the attitude toward health or nutrition promotion at school level had been improved because the schools continued to promote health and equipped students to be health advocators. As known by the researcher, in one of the intervention school, the coordinating teacher

continued to lead the club to organise health-promoting activities in school after the conclusion of the intervention. With only some inputs and consultations by the researcher and corresponding institution, the club had carried out Healthy Cooking Competition, Healthy Teatime Gathering, Healthy Breakfast Day, farm visit, first-aid classes, basic health screening, Healthy-heart Robe-skipping Campaign, Health-promoting Carnival etc. in the year after the intervention. Some activities involved only the members, while some activities, using a whole-school approach, served and targeted at all students and staff in school, as well as parents and community members. In the school's anniversary day, they used "The healthy campus full of youthful spirit, all hand-in-hand to celebrate the school's birthday" as the school's slogan to show their concern in one's health and the ambition of school health promotion.

In the other intervention school, although the club terminated after the study due to lacking the support from the school principal and diverse priorities in school, such as Information Technology and Curriculum Integration, but not health education. Instead of running a health club, the coordinating teacher sought other support outside school and sent some students to the Student Health Ambassador Programme, organised by the Department of Health of Hong Kong SAR, soon after the study. Further utilisation of community resources continued the training of some devoted members, who would further promote health in their school in the coming future, meeting the aim of the Ambassador Programme and continuing the mission of the Health Concerning Club.

Chapter four: Discussion

In order to enhance the nutrition knowledge, attitude towards health eating and healthy eating habits of junior secondary students in Hong Kong, a school-based nutrition education model named the Health Concerning Club Programme had been developed based on the Social Cognitive Theory, which emphasised demonstration, skill training, self-control and empowerment. This study assessed the effectiveness of the intervention in changing participants' knowledge, attitude and dietary behaviours, as suggested by Contento *et al.*'s (2002) review that these aspects were widely measured in 80-90% of the intervention studies in school. Both comparisons of statuses at baseline and follow-up between the intervention and Control Group, as well as the changes of each group over time were assessed and identified in the previous chapter. In this chapter, further interpretation of the results, review of the process and management of implementing such an intervention, limitations of the study, and recommendations will be discussed.

4.1 Interpretation of results

4.1.1 Nutrition knowledge

Although there was no significant whole-group improvement from baseline to follow-up or relatively high scores at the follow-up status when compared with the control, it was found that male students and secondary two students were found to have relative improvement in their nutrition knowledge.

The overall knowledge score of males in the Intervention Group was increased by 6.55%, whereas that of the control males was decreased by 5.79%, in particular the "Diet-disease relationship" subsection. The change in opposite direction led to significant group differences in males' knowledge scores at follow-up. Literature

indicated that boys had generally lower nutrition knowledge and nutrition attitudes than girls in the grades of junior secondary (Pirouznia, 2001; Gabhainn and Kelleher, 2000; Wong *et al.*, 1999). In this study, males in Control Group scored significantly lower than that of the females at follow-up, which was not found at baseline or in the Intervention Group. Such findings indicated that males in Control Group had downward performance in the nutrition knowledge test without the intervention programme; and the intervention might have contributed to the maintenance of the knowledge performance of the male participants.

For the secondary two students in Intervention Group, they were found to have significantly higher knowledge score than the controls at baseline; such pattern sustained at follow-up. While no change of knowledge score was found in any grades of the Control Group, a significant improvement of the secondary two students in Intervention Group by 7.44% was found. At baseline, the knowledge score of Intervention Group was in ascending order by grade; however, the pattern changed at follow-up that the secondary two students scored the highest among the three grades. Such illustration proved that the secondary two students particularly improved in nutrition knowledge throughout the intervention. On the other hand, no such changes were found in secondary one might be due to the period of adaptation to the secondary-school life and such a structuralized extra-curricular programme. For the secondary three participants, who have the most number of subjects to learn in class among all the grades in secondary school life, might found it ineffective in gaining further nutrition knowledge by another extra-curricular lesson.

In fact, as the correlation between nutrition knowledge and attitude was found at follow-up ($r=0.331$), showed that the intervention reinforced some students who were more positive towards learning nutrition, and they really gained knowledge

eventually. This correlation was also similar to those reported by Wong *et al.*(1999) and Lewis *et al.* (1989), although these research studies targeted at older college students.

How effective was the intervention to improve students' knowledge in comparison with other studies? Know Your Body programme in Crete was also able to increase 13 to 14-year-old students' nutrition knowledge by 16% (Lionis *et al.*, 1991). The Slice of Life programme was able to increase 14 to 16-year-old students' healthy food knowledge by 10.6% for males and 7.8% for females (Perry *et al.*, 1987). Stanford Adolescent Health Program was able to increase Intervention Group's (with mean age of 15) nutrition knowledge by 16.3% for males and 23.7% for females (Killen *et al.*, 1988). For the Health Concerning Club Programme, the whole-group improvement in knowledge was 3.85%, in which 6.55% for males and 3.79% for females. The small and non-significant impact might be due to the extra-curricular approach that students found it difficult to pay attention in the after-school period. This was especially so when the activities using play-approach were launched by classmates and an external tutor. When compared with other studies, in which most of them were incorporated in the formal curriculum and carried out by experienced or trained teachers. A recommendation for disseminating nutrition knowledge in addition to the developed programme was distributing health pamphlets produced by the Department of Health, Hong Kong (SAR), which provide ready-to-use and reliable health information for students.

4.1.2 Attitude towards healthy eating

Significant drop of the attitude mean scores was observed in both intervention and Control Group. When attitude score was grouped into less precise but more general categories, (1) positive or (2) neutral/ negative, a different picture was shown. The proportion of "positive" students in the Intervention Group remained

statistically unchanged while that of the controls (both overall and three of the subsections) decreased significantly. This led to the difference in the proportion of "positive" students between Intervention Group and control at follow-up (in both overall attitude and the "Self-responsibility towards healthy eating" subsection).

Special changes of specific attitude items were identified and explained in the following paragraphs. In the "Positive view towards healthy eating" subsection, both intervention and Control Group showed significant drop in the mean score of two of the attitude statements (items): (1) "I am interested in knowing more about nutrition" and (2) "If I am careful about the way I eat now, I will be healthier when I am older". Although we cannot be certain about the reasons of Control Group's drop, it should be noted that the drop in the Intervention Group might be due factual influences of the intervention. When considering the first mentioned statement, participants of the intervention might shift or expand their interest of learning to other health content areas, like physical exercise. After one year of comprehensive nutrition education, their interest on similar topics might have reduced relatively. When considering the second mentioned statement, participants seemed not to believe the importance of healthy eating on health. However, they were actually taught with the concept of holistic health which were influenced by various factors like physical exercise, work and rest management, interpersonal relationship, optimistic thinking. The significant drop of score might be due to the recognition of multi-factorial influence on health.

For the Intervention Group in the "Self-responsibility towards healthy eating" subsection, students with positive attitude for most of the items remained unchanged; the exception was "I'll worry about the way I eat when I'm older". The significant drop of this item could be explained by the side-influence of the intervention. Since the participants were fostered with concepts of being responsible and health

concerning throughout the programme. When considering the mentioned statement in the follow-up survey, students might somehow think that they are already old enough to care about nutrition, or they will concern nutrition both at their age and in the future, especially when the translation of "worry" in Chinese version closely means "concern". Therefore, the agreement of this statement in this case might not certainly mean low self-responsibility towards healthy eating. On the other hand, the Control Group showed significant decrease in the proportion of "positive" students in this subsection, including significant drop in three items: (1) "Knowing more about the food I eat is eat is important to me", (2) "I really don't care what is in the food I eat"; and (3) "I would acquire healthy eating habit". The above illustration further proved the downward change of Control Group's self-responsibility without such an intervention.

In the last subsection, "Perspective of weight control", the proportion of "positive" students in Intervention Group remained unchanged, while that of the Control Group dropped significantly. When looking at the "I tried on diet to lose weight in the past year" item, both groups showed drop in attitude from baseline to follow-up, especially for females. Nowadays in Hong Kong, many adolescents are preoccupied with the growth and physical changes in their bodies. At the same time, they are developing mental and emotional coping mechanisms to deal with those changes in puberty. However, the society (including the media) is obsessing young people with slenderness and weight control, and putting additional pressure on them (Giarratano, 1997). About 40% of the students in the study were not satisfied with their body shape and weight (39.8% vs. 43.4% of Intervention Group and controls respectively agreed with another attitude item, "I'm not satisfied with my recent body shape and weight" at follow-up), although there were less than 20% who reported underweight or overweight (Table 3.5). It was a great challenge for health educators to train adolescents how to resist the trend and preoccupation of the

society. At baseline, 8.4% and 13.3% of the students agreed that they had tried dieting to lose weight in Intervention Group and controls respectively, while 14.5% of Intervention Group and 21.7% of controls also agreed with the statement at follow-up. Nevertheless, the mean score of this item of Intervention Group was higher than controls at follow-up ($t=2.15$, $P=0.033$), indicating that the intervention might have prevented some students from non-necessary dieting to lose weight.

In addition to the above explanations, we can further explore the attitude findings from two of the *characteristics* of attitudes. Although attitudes are *enduring*, which tend to be relatively stable over time (Goldstein, 1994), this study showed that the adolescents' attitudes were changed from baseline to follow-up. Attitudes are also *learned* through socialisation and other learning processes (Goldstein, 1994); mother, siblings, and friends were identified as important predictors of subjective norm, which also predicted the intention of a healthy eating behaviour (Backman *et al.*, 2002). In the intervention, however, these persons were not yet intervened directly, and their influences on students' attitude and intention towards healthy eating might be significant. Adolescents in both intervention and Control Group might also be facing challenges against the attitude towards healthy eating, including the mass media, dissemination of misconceptions related to weight control, psychosocial factors related to adolescents, attractiveness of the tasty but unhealthy food, vulnerability of adolescents under peer pressure, food choices of parents and siblings. The intervention's effect on promoting positive attitude on healthy eating, therefore, might be limited. In fact, since the attitudes of healthy lifestyle conceived by adolescents generally are not very positive, the intervention could be interpreted in another word that it might have prevented the students from becoming too negative against healthy eating, in comparing with the control. Longer time is required to indicate the positive change of attitudes in the Intervention Group, because attitudes are enduring.

4.1.3 Dietary behaviours

Breakfast is the most important meal of the day and skipping breakfast could adversely affect students' nutrition status and attention in school (Pollitt *et al.*, 1981; 1983 and 1995). Lee *et al.*'s survey (1999) showed the rate of skipping breakfast increased with age. The Health Concerning Club programme had prevented the students' rate of skipping breakfast from increasing, leading to a significant lower rate than that of the controls at follow-up. Those breakfast skippers in Control Group were found to have lower consumption of fruit and vegetable (almost all of them consumed less than two servings per day) than those having breakfast. The absence of such correlation in Intervention Group might mean that even though some of the students chose not to have breakfast, it did not lead to low consumptions of fruit and vegetable.

In retrospect, the importance of having healthy breakfast had been reinforced by the newsletter, which was believed to the key to change. In one of the newsletter published, members of the Club researched on the breakfast habit of students in the whole school. A random sample of 274 students in the two intervention schools was surveyed on frequency of having breakfast, type of food eaten, time spent for breakfast and reasons of skipping breakfast. The researcher facilitated the data analyses and write up process. Bread, sandwich and noodle were the most favorite breakfast food; water or tea, chocolate milk and soymilk were the most favorite breakfast drinks. Through the survey and publication, students learnt to evaluate a meal and some tips for healthy breakfast. This approach was proved to be effective to encourage dietary change.

Carbonated or sugary drinks was the most favourite drink among the list of snacks; its consumption in the Intervention Group dropped significantly in terms of the

proportion of students having the drinks four times or more per week. The finding is encouraging in such that participants of the intervention had learnt to drink less of such a sweet beverage. The pattern of milk choice, being a healthy alternative of beverage, was significantly improved that there were more students choosing only low fat or fat free milk, but avoiding high-fat or sweetened milk. Since similar change was also observed in the Control Group, we concluded that the improvement was due to the promotion of the importance of healthy milk choice in the community and mass media, rather than the intervention.

The World Health Organisation recommended the public to consume at least 400 grams of fruits and vegetables per day for good health (WHO, 1991), which are about five servings (each 80 grams) a day. In this study, the consumption of fruits and vegetables were estimated by semi-quantified items of eating green vegetable, other vegetable and fresh fruit during the seven days preceding the survey. It was noted that the serving sizes listed on the questionnaire served as examples helping the respondents to approximate the frequency of having such amount of food, but not precise measurement of the weight of food eaten. Analyses in this study were aimed at identifying changes, and the categorisations used were referable to statistical classifications but not dietary recommendations for good health. Ammerman *et al.'s* review (2001) indicated that dietary interventions were positively associated with changes in fruit and vegetable intake, with an average increase of 0.6 serving per day in 96 studies reviewed. The Health Concerning Club programme increased participants' consumption of fruit and vegetables by 0.87 serving per day, which was slightly higher than that of the literature. In comparison with the control, the significant improvement of the proportion of students who consumed five or more servings of fruits and vegetable per day in the Intervention Group had proved an encouraging achievement of the intervention.

For cereal flakes' consumption, the small increase in Intervention Group remain non-significant, but contributed to a difference with controls at follow-up. The consumption was correlated with fruit, fresh fruit/vegetable juice and other healthy food. Such findings indicated that the intervention did link some healthy dietary behaviour together, implying that health promotion on one food might lead to series of behavioural changes. On the other hand, in Control Group, no such patterns were found except a special strong correlation of 0.631 between cereal flakes and dairy product consumptions at follow-up, meaning that majority of the controls (90.2%) who consumed cereal flakes less frequently also drank less milk and vice versa. Ordinary students might think that cereal flakes and dairy product are good mates, but in fact, they can be served as independent healthy snacks. One point to add is that consuming cereal flakes does not always mean a healthy food choice; it depends on the type of flakes, for example, some cereal flakes packed with a healthy image to attract consumers may be sugar-coated and contain too much simple sugar but little dietary fibre. The skills of reading food label had been stressed in the newsletter. Since the frequency of consuming cereal flakes had not been further differentiated into types of cereal flakes, the conclusion of this behavioural change is not so strong.

The last behavioural change found was the significant increase in the proportion of students in Intervention Group who always remove poultry's skin before eating, which was not found in the Control Group. Since the skin of poultry contains high percentage of fat, the habit of avoiding the skin is good for the students to protect their arteries from the attack of bad cholesterol.

Dietary behavioural changes and the Social Cognitive Theory

The strategies used in the intervention were based on the Social Cognitive Theory, which helped to explain the dietary behaviours found in the Intervention Group at follow-up. Following paragraphs describe several constructs of the Social Cognitive Theory, how it lead to some behavioural changes, and suggestions for further development.

1. Environment and situation

"Environment" in Social Cognitive Theory refers to an objective notion of all the factors that can affect a person's behaviour but that are physically external to that person; and the term "situation" refers to the mental representation of the environment that may affect a person's behaviour (Glanz *et al.*, 1997). Examples of the social environment in the students in the intervention included family members, friends, classmates, and members in the club. The rationale of the intervention aimed to develop social environment supporting health behavioural change. For example, if fruits and vegetables were available and were also perceived by student as something that other members eat and value for their health, the student might begin to eat it. The change of reducing consumption of soft drinks and developing healthy milk choice could be also explained by the social environmental influence. Croll *et al.'s* study (2001) showed that the barriers for youths to adopt healthy eating included lack of time, limited availability of healthy foods in schools (physical environment), and a general lack of concern regarding following healthy eating recommendations. The intervention, however, did not reach the physical environment level of school, food selling in the tuck shop, and lunch provided in the restaurant around school (no lunch is provided by the two intervention schools) were not yet intervened because of the intervention design and administrative reason. The effect of the intervention was therefore limited.

2. Behavioural capability and self-efficacy

Behavioural capability is the result of the students' training, intellectual capacity, and learning style (Glanz *et al.*, 1997). In the intervention, skills trained included healthy cooking skills, healthy food choice when dining-out, decision-making skill, goal setting, problem-solving skill etc. Role-play and practice were used to help students to acquire the skills and increase their confidence to practise in real-situation. The behaviour of avoiding poultry's skin was an example of this construct, in which the message of reducing food high-in-fat in their diet was frequently stressed, and the students strengthened their efficacy in deciding not to eat these food and practised skills to prevent them. Since the process of internalising knowledge and skill into daily practice is a long journey, more training is needed to let student gain mastery of the skills in relation to healthy eating. For further development, we can identify small steps to be changed when setting goals, arrange repetitions to practice the health skills, and always recapture the progress of achievement throughout the programme.

3. Expectations and expectancies

Expectations are the anticipatory aspects of behaviours that certain events are likely to occur in response to his or her behaviour. On the other hand, outcome expectancies are the values or incentives that a person places on a particular outcome (Glanz *et al.*, 1997). For instance, in the intervention, both consequences of skipping breakfast on long-term health and short-term benefits of having a good breakfast (such as good concentration and performance in class) were emphasised; this might foster students with health expectations and positive expectancy towards having breakfast, leading to the significant maintenance of this habit in compared with the control. In order to improve further, we should help make healthy eating easy for youth to apply and explain more the consequences of unhealthy eating in terms that they value, stressing meaningful short-term benefits (Croll *et al.*, 2001).

4. Self-control or performance

Goal setting and self-evaluation were used in the intervention to help students to identify self-control targets and incentives to change. As observed, many students set increasing their consumption of eating fruit and vegetables as the dietary goal; this helped to explain the significant improvement of the Intervention Group in eating more of these foods. When promoting healthy eating in the future, it is suggested that the programme should help students to set dietary goals which are SMART (that is Specific, Measurable, Attainable, Realistic, and Timely) and ensure frequent progress checks, companied with enough extrinsic and intrinsic reinforcement.

5. Observational learning

Observational learning means the process of acquire a behaviour by watching actions and outcomes of others behaviours (Bandura, 1986). Ideally, the senior members and committee members in the Intervention Group were expected to acquire healthy eating skills and act as a role model to influence the junior members to practice healthy eating. In practice, however, their role-modelling effect was effective to a certain extent for some behavioural changes; more time and reinforcement are needed for these students to become confident and credible in acting as a healthy role model within the club and in school. At the same time, in contrast, there may be negative role models existing in students' social environment such as family members, mass media, and peers having unhealthy lifestyles, which influence the students to adopt health behaviour.

We can summarise the above points by one of the concepts of Social Cognitive Theory, reciprocal determinism, which stresses the dynamic interaction between Person, Environment and Behaviour (Glanz *et al.*, 1997). For example, a boy

might not like eating vegetable because of the dislike of its taste. He had strengthened the dislike by his siblings and friends who also dislike eating vegetable. At some point, however, the boy joined the Health Club, learned the importance of eating vegetable, and decided to try some new and healthy vegetable. However, he encountered the pressures from his old friends. To avoid these negative pressures, he might seek new friends from the club (a new social environment) who value healthy eating and support his new behaviour of trying vegetable (reciprocal effect). This change, in turn, might motivate an old friend to begin to eat vegetable as well (a reciprocal effect to that friend). Since such interaction may change from time to time, new pressures from the environment and self-vulnerability might hinder further development of the health behaviour or habit.

4.2 Review on the process and management of the Health Concerning Club

In running the Health Concerning Club for a year, the researcher and the students strived to build a cooperative, harmonious and interesting group, which was conducive to students' health. Success or failure of the intervention always depends on the management of the process. A review of the works done in the Health Concerning Club is illustrated in this section from the following nine aspects.

4.2.1 Content design

The researcher and student committee tried hard to make the programme content be (1) meaningful to the participants, (2) lively and interesting, and (3) supported by plenty of reference from the participants. For the first target, the programme content was based on theoretical approach aiming at equipping students with comprehensive nutrition knowledge and skills by educational and experiencing activities, and was believed to be developmentally appropriate and suitable for

junior secondary students with diverse abilities. Its effectiveness had been proved by knowledge and behavioural changes identified. For the rest of the two targets, the researcher sought reference from the student committee about the content and formats of activities, since they were the representatives of all the members, acting as a friendly and direct channel for members to express their opinions. Sharing articles in newsletter and suggestion box were also available for members to give feedback to the organiser. About half of the students felt the activities interesting and liked the formats (see Table 3.32), however, pointed out that the three targets had not been completely achieved. In retrospect, there were regular meetings with student committee evaluating the acceptance of the activities held and discussing strategies for further development, but no feedback or suggestion about the format of activities from ordinary members had been received; articles received were about feelings on health or nutrition instead. In fact, regular feedback survey for each two or three workshops was intended to assess the level of satisfaction throughout the programme quantitatively. Unfortunately, students expressed that they did not like filling in questionnaires and asked the researcher not to arrange too many questionnaires (in fact, only the pre-and-post-surveys had been formally arranged, in addition to some informal questionnaires presented as worksheet or group project task), thus such quantitative data collection had been given up after one administration of the feedback survey. For further implementation, new strategies such as focus group, interview or games had to be developed in collecting plenty of the ideas of students' preferences on nutrition education in programme planning. Arnold *et al.* (2001) suggested an assets-based approach (rather than a traditional needs-based approach) that could be adopted to identify activities based on students' interests, trust, and assets, emphasising what they want to share or experience more than what they are judged to need.

4.2.2 Appropriate venue and facilities utilisation

Thanks to the support from schools, intervention activities could be carried out in independent, clean, tidy, and comfortable activity rooms, accompanied with adequate audio-visual equipment. The venue had been decorated for sometimes to build up an atmosphere for activities, for example the "Nutrient Catwalk". The schools also provided a notice board for the club to disseminate updated club information and health messages. In addition, the schools gave subsidy for the "healthy living camp" at a beautiful campsite having plenty of recreational facilities; students could therefore enjoy learning in an appropriate and relaxing environment.

4.2.3 Proper instruction and leading

With the help from teachers and student committee, the researcher was able to manage the progress and administration of the club smoothly by frequent contacts with students and school visits. Table 3.30, showing students' satisfaction, indicates that the researcher, having a bachelor degree in Food and Nutritional Sciences and working experiences in a health education and promotion centre, was knowledgeable and enthusiastic in promoting health in school. Not being a full-time staff in school, the researcher sometimes found it difficult to handle daily and ad hoc issues related to the club, thus needing indirect handling by the coordinating teachers. In fact, teachers are the most suitable persons to maintain a health club when they are equipped with health promoting knowledge and skills, because teachers are closer to students and able to build sense of belonging and morale of the club more easily than an external and temporary tutor.

4.2.4 Utilising students' talents

Abilities and talents of the students, especially the student committee, were trained and utilised in the programme in addition to the skills of healthy eating, such as leadership, attitudes of being responsible, cooperative and considerate, abilities of

organising activities, designing and artwork etc. The focus groups indicated the multi-skills learned by the students, and they cherished the sharing and working with club members from their school and the other school in the "healthy living camp".

4.2.5 Attendance and interest of participation

The 78% attendance rate of the workshops and high participating rate in school carnival indicated the achievement of the working team and whole-school approach in attracting students to join. The reason for the rest of the students not devoting so much time in the programme was multi-factorial. The factors that might affect the attendance and interest of participation are illustrated as follows:

(1) Academic workload and multi-skills training affected very much the attendance rates. Those students who were poor in academic performance might lack motivation to join extra-curricular activities; while those who performed well might be afraid of spending too much time in other non-academic activities. Record showed the reasons of absence were mainly time crash for extra-lesson, recreational training or activity in other club.

(2) Students had different mental needs other than learning nutrition when joining the club such as making new friends, positive recognition, building self-esteem, leading the youngsters etc. If such needs could not be fulfilled in the club, students would not identify with the club. However, further research is needed to explore students' mental needs.

(3) The Health Concerning Club aimed at equipping members with nutrition knowledge and healthy eating skills. The students, however, might have additional expectations of the programme. As indicated from the focus groups, some students wanted more outings, exciting games, newsletters, but fewer questionnaires and discussions that required critical thinking. If they found inconsistency between outcomes and expectations, they would reduce interest in

joining the activities.

(4) Student committee had higher devotion to the club as they had more chances to participate in various decision-makings and planning in comparing with general members. It was relatively more difficult to motivate general members to attend and participate.

(5) Status of the club in school: clubs with longer history and fine tradition were believed to gain members' devotion easier than general clubs, since people always like good reputation. As observed by the researcher, the Health Concerning Club had not been recognised as famous and popular in school by the end of the intervention yet. Longer time is required to build up reputation and gain students' admiration.

(6) Atmosphere of the Health Concerning Club was mainly caring, harmonious emphasising sharing and being responsible, which pulled most of the members together; while those students expecting excitements and great challenges might not be satisfied and fully participate in the activities.

4.2.6 Source of expense

The research institution supported much of the regular expense of the club such as printing the teaching material and newsletter. School's subsidy, member annual fee and charge for the camp were also the financial sources. Students still had to pay (same as the members in other clubs) because they were the final gainers of health knowledge and had the responsibility to share the expense, but at very low cost. A student treasurer helped in recording and reporting the expenditure to the schools.

4.2.7 Harmonious relationship of members

Joining extra-curricular group activities was an excellent chance to foster friendship and communication skills, so different strategies were adopted to facilitate the building of members' relationship. Strategies included: (1) forming base-groups;

(2) arranging ice-breaking and discussion sessions in the workshops; (3) organising the "healthy living camp" to provide chance for affective sharing and collective creation through cooperative games and competitions; and (4) arranging students to take charge of the activities by turns. The only ways to build close and sincere relationship among the members are constructing democratic atmosphere, providing equal chance to serve and to be served, and advocating actions of helping each other.

4.2.8 Sense of belonging to the club

The same as many other clubs, some members in the Health Concerning Club joined the activities happily at the beginning but absented from the activities towards the end of the programme. There were some other members that still exerted their full strength for the club. Whether the content was attractive was undoubtedly a reason behind the phenomenon; the strength of sense of belonging was another invisible mental reason diffusing among the members. It is quite difficult for the researcher to analyse what had been done in the programme focusing on the sense of belonging to the club and its effect. For instance, because the researcher named the "Health Concerning Club" and the members had no intention to change or generate another formal name of the club throughout the programme year. Some health-promoting professionals may wonder if the club had a more creative or attractive name selected by students themselves, because one of the cardinal rules in health promotion design is to involve the target audience as many planning aspects as possible. In fact, some members called themselves "Kin" (meaning Health in Chinese) in school, and they appeared to enjoy it and, in another way, build the sense of belonging to the club[4]. Therefore, there is no standard key to success or fatal error in the aspect of building sense of belonging. Instead, based on the experience of this study and literature (Education Department of Taiwan, 1995), following possible methods are

[4] To add a note, the committee members were involved in deciding and modifying the content and name of numerous activities and the newsletter throughout the programme.

suggested for further interventions and anyone interested in running a health club in this aspect: (1) organising short-term or long-term trainings for the student committee to gain problem-solving skill, leadership and adaptability to new surroundings, roles and responsibilities of a committee member; (2) organising easiest and unmixed sharing activities such as outing, barbecue, dining together, camp and party in festival to reinforce affective sharing among students; (3) creating collective experiences such as a designed badge, sign, flat tint, or even an unique club song, laugh, gesture or joke which can only be understood by the members, so as to attract members by experiencing the community norm; (4) emphasising the mission of promoting school and community health for the members to strive for; (5) stating new targets and activity styles to attract new members when facing low attendance and loss of interest, for example, find students' new interests on health which may not be healthy eating and arrange new organisations for visit; and (6) reinforcing active participation by involving more members at planning and implementing level, making the activities be the common concerns and sources of pleasure. To conclude, student groups are built by social affection which is naturally developed but not purposely arranged; therefore, the best way for a health club to progress continuously is setting priorities of the club and planning diverse activities that allow members to construct the sense of belonging naturally through participations.

4.2.9 Rules and activity records keeping

Complete record of the club within the intervention period had been kept for future student committee and past members to share, as well as process evaluation of the study. Basic information kept included school's regulations to the club, rules of the club, framework of organisation and member name list; activity records kept included annual activity plan, workshop plan, implementation record, attendance and level of participation; financial record of income and expense was kept, too.

4.3 Further implication of the study: from the Health Concerning Club to a whole-school approach

As illustrated in the last part of the results chapter, the intervention schools continue to promote healthy eating and health in different ways. These sustainable outcomes carried on independently by the schools or students after the intervention are valuable and important. This is because that a year of intensive programme leaded by a non-school member could not guarantee bringing long-term benefits, if no further reinforcement of maintaining a healthy life-style given to the students. At the very beginning stage of the study, the idea of running a health club even after the study, in order to carry on the promotion of healthy eating and other health aspects, had been suggested to the corresponding teachers. That is why the name of the club is as mentioned but not "Healthy Eating Club" or else wise. The empowerment of school-based health promotion was continuously reinforced to the teachers and members throughout the programme. Fortunately, the programme successfully internalised the responsibility and mission of health promotion from a research institution to school members.

To explore further, the school leader(s) is (are) the most critical person(s) in school health promotion. If a school leader does not see health promotion importance relatively, the effect would be small even though there is a health club, because it becomes only one or two teachers' business. In contrast, if a school leader sees health education and health promotion an important priority, the school can promote healthy eating by working in the school policies and environment, health education, nutrition services, school social environment, health promotion for staff, family and community involvement etc. suggested by the Centre for Disease Control and Prevention (CDC, 2000), in which the first two components are focused in the following paragraphs: (1) school policies and environment, and (2) health education.

School health policies on healthy eating would be the first step to start the wheels of school health promotion in motion. Written health policies should be able to provide clear rationales and guidelines to school members as well as outsiders to know the standpoints of school regarding health aspects. Content of school food services policies should include how to make foods available that are low in fat, sodium, and added sugars wherever food is served inside and outside the tuck shop or school canteen. For those schools, which would arrange lunch for school members, guidelines in regard to food safety and nutrition should be delivered to the caterer. Nutrition education policy could also be developed to ensure time provided for teaching healthy eating to appropriate grades by both formal and extra-curricular activities.

In addition, with the increasing recognition of the importance of the physical environment in facilitating or hindering individual behaviour change, the content and strategies of the intervention should further expand to the environmental level and putting the written policies into practice (Contento *et al.*, 2002; French *et al.*, 2001). Wechsler *et al.* (2000) stated several key environmental influences to promote healthy eating in school which should be considered: recess periods, foods and beverages available at school outside of the school meal programme, and psychosocial support for healthy eating. Neumark-Sztainer *et al.* (2003) also found strong correlation between adolescents' fruit/ vegetable intake and home availability of fruit and vegetable. Interventions to increase fruit/ vegetable intake or other dietary behaviours in adolescents would be more effective if target environmental factors such as greater availability of healthy food. These literatures support the importance of providing a healthy eating environment for students. Recently, 67% of schools in United States do not allow students to purchase "junk food" at lunchtime, and only 45% of the schools offer two or more entrees, vegetables, and

fruits each day for lunch (Brener *et al.*, 2003). Although the statistics of schools in Hong Kong having regarding food service policies and related programmes had not been published, it is believed to have room for development. As known by the researcher, at least one of the intervention schools did review their food service policies after the study and included related issues in the agenda of the regular administration meetings in school. This further proved the improvement of awareness and attitude towards healthy eating in school.

Strengthening health elements in the existing formal curriculum is the second focus in this section, which should not be ignored or delayed if one wanted to promote health and healthy eating effectively. In addition to the existing nutrition education curriculum, essential topics addressed by the intervention that should be taught include, identifying foods that are low in fat, cholesterol, sodium, and sugars, accepting body size differences, influence of families, culture and media on dietary behaviour, goal-setting skills for healthy eating, healthy weight control and eating disorders, and how students can influence or support others to engage in healthy dietary behaviours. Other essential nutrition topics, which are also recommended for further development of the curriculum, include using food labels, and how to find valid information and services related to nutrition and dietary behaviour. This intervention also raised the importance of students' active participation in learning nutrition, rather than lecture format. Teachers should pay more efforts and use different strategic approach to involve students in active learning when teaching health and organising health-promoting activities; and continuing education on health issues and teaching techniques for teachers is essential for quality health education in schools.

4.4 Limitations of the study

4.4.1 Volunteer bias

Since the recruitment of sample in Intervention Group was voluntary, those students who joined were believed to have high motivation to learn about nutrition and healthy eating. Volunteer bias reflects the error of magnifying impacts of an intervention because of the natural improvement by the volunteers. This bias was difficult to be eliminated in the study, because a major characteristic of this study was to promote healthy eating through extra-curricular activities, which fitted with the daily routine of school. Students understood that the education programme was initiated by the researcher, but did not strongly feel that they were "samples" of a study. Random selection of individual students or compulsory workshops, on the contrary, might affect the participation rate and willingness to devote because of the emphasis of "randomised sampling". Whole-class or Whole-grade approach might be good selecting methods to reduce volunteer bias, but it would increase the difficulty of arranging time, venue and manpower for after-school workshops. Generating an additional Control Group having the development of Health Concerning Club, voluntary recruitment of samples, but placebo of nutrition education (including general nutrition talk, board displays and pamphlet distribution) would be a good research in the future with elimination of the volunteer bias by comparing both voluntary samples. Therefore, in order to make sensible conclusion with minimised volunteer bias, the model being tested would only be generalised to those secondary schools having the feasibility of developing a club with 'voluntary' members. Actually, a further aspiration of the model was to equip those volunteers to be the "seeds" or "ambassadors" of health promotion to approach the non-volunteers or less-motivated members in schools.

4.4.2 Unable to match same case

Since the pre-and-post surveys were anonymous, the researcher intended to use the first six digits students' Hong Kong Identity Card number (ID) to match the same individual in the two surveys. The importance of following up the same case but not identifying individuals had been explained to the students when conducting surveys. The questionnaires were kept confidentially, and no one except the researcher would know what students write. Unfortunately, less than 80% of the respondents had reported their IDs (the rate was even lower in Control Group). Students were so sensitive to the disclosure of their IDs even though no complete set of number had been collected. As a result, group analyses were performed instead of paired tests (e.g. paired t-test). This limitation might reduce the ability of tests to identify small change's significance because of the small sample size and wide distribution.

This limitation also leaded to a matching problem the Control Group. In fact, more than one thousand students in the control schools had completed the baseline survey (secondary one to three) and follow-up survey (secondary two to four) respectively, but only 83 of them were matched for each survey according to gender and grade of the intervention (that is the same number males and females from corresponding grades were randomly selected from the control data set), so the ones chosen as control at baseline might not be chosen at follow-up to a certainty. Some of the significant changes found (or insignificances) in the Control Group might be somehow due to the selection bias of comparing different groups within the control data set. Some ways had been considered to ease the problem, such as whole control data set comparison, using other clues to match, selecting only those cases having ID provided as control etc; but none of these worked without creating other biases. The researcher finally accepted this as a limitation, and tried to minimise

its influence by putting more emphasis on group differences in same survey especially at follow-up. Changes of the control were relatively less emphasised but were still comparable because all the students in the three grades had equal chance to be chosen as control. When doing similar survey in the future, the researcher will pay extra attention in the matching procedure. Adolescents are clever, sensitive, challenging, but would cooperate and understand the importance behind when provided with enough explanations. Respect, patience and cautiousness are in fact the key attitudes when handling with this issue and also the lessons learned from this study.

4.4.3 Dietary assessment tool

Dietary behaviours are important outcomes of the intervention, which were assessed by a semi-quantified food frequency table and several multiple choices questions in this study. Whereas, food record and 24-hour recall were commonly used to assess the diet history of people in many other studies. The three mentioned methods had their own advantages and disadvantages. For instance, a food frequency table pinpoints food groups, which may be excessive or deficient in the diet. It is easy to be administered, time saving and has a stronger generalising power than the other two methods. The 24-hour recall, however, is more likely to provide accurate data than estimates of average intakes over seven days. Whereas, food records, which record the food eaten, time of day, place where eaten, others present, and mood, can help to determine factors associated with eating, but require cooperative students, considerable time and professional interpretation (Whitney and Rolfes, 1999).

One limitation of the assessment tool used in this study was that the estimation of serving sizes might not be correct. A student who reported eating "a serving" of vegetable may not distinguish between one bowl and two bowls; only trained

individuals can accurately report serving sizes. Students tend to remember the serving sizes of foods they like as being larger than serving sizes of foods they dislike (Whitney and Rolfes, 1999). Food models or photos and measuring devices can help students identify the types of foods and quantities consumed, and are recommended for future use.

No nutrient intakes could be estimated from the data collected because of its rough food group classification (which was time-saving, but caused another limitation). Nevertheless, it should be reminded that nutrient intakes in adequate amounts do not guarantee adequate nutrient status for an individual. Likewise, insufficient intakes do not always indicate deficiencies, but instead alert the assessor to possible problems. For recommendation, further validation of the dietary assessment methods is essential (McPherson *et al.*, 2000), and 24-hour recalls on several non-consecutive days are suggested as an alternative to assess nutrient intakes as important indicators for behavioural changes when enough resources are available (Young and Fors 2001; Lionis *et al.*, 1991; Luepker *et al.*, 1996; Kumar *et al.*, 1993).

4.4.4 Attitude and Knowledge sections of the questionnaire

Although the questionnaire used in the study had been pre-tested for its validity and reliability, there is a limitation of the attitude section, which should be stressed here. Since the Social Cognitive Theory had been studied and explored throughout the study, so as to be adopted in the intervention, not all domains of the Theory had been assessed by designing related question items at baseline. For instance, the measurement of students' empowerment or self-efficacy that seem fundamental to the Theory was therefore weak and limited. Further revision of the attitude section is needed to measure a more comprehensive picture of students' psychological

determinants regarding healthy eating.

4.5 Further research

In order to further prove the effectiveness of the model on adolescents, research is recommended by repeating the intervention in more schools with increased sample size, especially for male students. In order to further explore the quality of the intervention from more points of view, interviewing the "frequent-absent" members, coordinating teachers, the principals and other staff in school are also recommended. If the members could be contacted in years later, follow-up assessment is suggested to identify the sustainability of behavioural changes, improvement of attitudes, and further nutrition knowledge gain from the curriculum or self-learning.

If the sample size has been increased, more data could be provided for factor analyses to identify main effects of gender and age, as well as factors determinate healthy eating.

To further develop the attitude section of the pre-and-post questionnaire, besides expanding the measures on outcome expectancies and locus of control, other psychosocial variables such as social norms and reinforcement, family support, preferences for targeted foods, and food choice intentions could be added to produce a comprehensive psychosocial assessment on students (Contento *et al.*, 2002).

According to other studies (Lionis *et al.*, 1991; Luepker *et al.*, 1996; Nader *et al.*, 1992, Walter *et al.*, 1988), physiologic measurements such as weight, Body Mass Index, skinfolds, serum cholesterol, and blood pressure were measured that could be added as strong indicators to assess the effectiveness of nutrition interventions in further intervention in Hong Kong.

As indicated by Backman *et al.* (2002), mother is the most important predictor of subjective norm of performing healthy eating; parent education is highly recommended in future interventions to enhance adolescents' health behaviours by fostering them with positive intention and providing healthy food in their daily life. In fact, families not only can influence adolescents' behaviours, but also can play an active role in school health promotion leading to a win-win situation (Birch, 1996). For instance, family members can improve their own personal health knowledge and skills from participating with their children in health promoting activities, and further lend support to a programme towards a comprehensive school health education.

Last but not least, Goldsmith and Reynolds (1997) recognised the benefits of peer programmes at different levels, such as peer leaders' benefits, prevention or interventional benefits, school and community benefits. In the intervention, peer-education was an important strategy adopted. The questionnaires of the student committee and ordinary members, however, had not been analysed separately or compared, since there was no clue for identification. Such comparisons are recommended in future researches for distinguishing the benefits gained by the peer leaders and those by the target audience.

Chapter five: Conclusions

The recent increase in the need of promoting healthy eating; adolescents are one of the groups needing nutrition education, in especially the knowledge and skills of healthy eating and the positive attitude towards making wise decision in diet for their health. School is an ideal setting to promote healthy eating for adolescents because school can reach almost all adolescents population and enable stable and frequent contact or intervention. Overseas studies and literatures proposed numerous approaches and theories in promoting healthy eating, in which the Social Cognitive Theory and some other advocating strategies were adopted to formulate a "Health Concerning Club" programme.

Effective programmes require credible and reliable evaluation tools to show their outcomes. This study stated the procedures of development of the questionnaire used to assess the outcomes of the programme and demonstrated precise and thorough validation and reliability tests of it. From the results of baseline and follow-up assessments, as well as the changes between the two assessments, the study proved the programme with different degrees of improvement in the participating students' nutrition knowledge, maintenance of their positive attitudes towards healthy eating and self-responsibility, as well as healthy dietary practices such as eating more fruits and vegetables, and avoiding eating poultry's skin.

Although the achievements found were not large, it does not certainly mean that the intervention was unsuccessful. This study helped the two secondary schools to initiate a student health-promoting society, and proved its acceptability to be positive in schools. Numerous factors regarding the effective implementation of the model had been explored, in specifically the ways to improve harmonious relationship of participants and sense of belonging to a health club. The mission of health

promotion sustained in the intervention schools that they continued to carry out school-based health-promoting activities after the proposed one-year effort in various ways, serving the school members, parents, as well as the community. The themes of these activities expanded from healthy eating to holistic health promotion, including physical, mental, and social health. Of course, the sustainable outcomes did not merely rely on a group of students or few teachers; instead, it relied on the recognition and tangible support from the school principal, enthusiasm and devotion of school staff, and active participation of the "audiences". A long-running and successful club should learn to be independent in organising activities, acquiring updated and accurate health information, utilising community resources related to health education and promotion, attracting newcomers and the target audiences of health promotion, and defining a clear role and mission in school in order to carry out quality and effective school-based health promotion. Investigation of the health promotion development in the intervention schools after the study is actually another research topic, but it is a fact that the intervention somehow initiated the process or part of the history of health promotion development of these schools, in which a "bottom-up" health-concerning club is developing into a "bi-directional" health-promoting school.

Most people would agree that health is important; but when problems or challenges come (for examples packed curriculum, busy staff, and lacking consensus with teachers), health is usually the first thing to be sacrificed. I hope that schools could encourage students to participate in health activities that help them practice health living by carrying out practical, active and interesting health education and promotion. As suggested in this thesis, developing the school health policies regarding nutrition/healthy eating environment and strengthening of the health curriculum are two of the cardinal tasks for effective health promotion in school. The results of this study have suggested that school-based initiatives in creating a

healthy eating environment is necessary for developing positive attitudes towards healthy eating and adopting healthy eating practice. The impact would be stronger if the health education curriculum would be further strengthened.

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Appendix A: Preliminary report on the survey on Promotion of Healthy Eating in Hong Kong

Date of survey: 26 Oct 1999

Number of respondent: 152

Mean teaching year of the respondents: 11.6 (SD±6.34)

Table A1: Type of education work of the respondents:

Type of education work	Frequency	Percentage
Secondary	84	55.3
Primary	36	23.7
Special school	26	17.1
Counselling	4	2.6
Pre-occupational	1	.7
SGO	1	.7
Total	152	100.0

Table A2: In the current education system in Hong Kong, can the respondents transmit health message to the adolescent students during their working time or not?

	Frequency	Valid Percent
Yes	94	63.1
May not	55	36.9

Table A3: The degree of barrier faced by the respondents when implementing health education in their schools

	Frequency	Valid Percent
No barrier at all	4	2.7
Little barrier	20	13.6
Some barriers	61	41.5
Quite many barriers	54	36.7
Many barriers	8	5.4

Table A4: Perceived effectiveness of the suggestion of developing a Health Concerning Club in school to help promoting health

	Frequency	Valid Percent
Can help in school health promotion	73	76.8
May not help in school health promotion	22	23.2

Table A5: Barriers faced by the respondents when implementing health education in their school

Type of barrier	Frequency	%
Teacher too busy	59	16.6
Lack of consensus with other colleagues	49	13.8
Lack of financial, manpower and place support	39	11.0
No support from school policy or principle	37	10.4
Current syllabus too tight	36	10.1
Lack of systematic health education syllabus or guidelines / health education is not included in the regular curriculum	24	6.7
Lack of consensus with parents	22	6.2
Teachers lack of health education knowledge and experience	22	6.2
Students do not concern and participate in health education matter	17	4.8
People's awareness towards health education is low	14	3.9
External factors fighting against health education (family, peer and media etc.)	13	3.7
School and parents only concern students' academic performance	10	2.8
Lack of community and professionals support	9	2.5
Special schools' problem	2	0.6
Many other activities exists	2	0.3
Health education seems to be simple and boring	1	0.3
Total Frequency	356	100

Appendix B: Workshop plan

Workshop 1—Introduction of the society and nutrition

Aim

After this workshop, the members will:

- ✧ Understand the mission and targets of Health Concerning Club.
- ✧ Know the committee members and the outline of the activities schedule throughout the year.
- ✧ Have the opportunity to think and clarify their thinking on "eating" and "food".
- ✧ Have the opportunity to measure their knowledge, attitude and behaviour towards healthy eating.

Schedule (Time: 65minutes)

Introduction of the society and the tutor	*15min*
Activity 1.1 Baseline survey	*25 min*
Activity 1.2 Thinking About Food	*15 min*
Activity 1.3 Nutrition Sentences Completing	*10 min*

1.1 Baseline survey

What and how: members completing questionnaires about the knowledge, attitude and behaviour of nutrition for evaluation.

1.2 Think about food: what do I know? *(Health Education Authority,1990)*

What: students think and discuss some examples of sayings about food.

How: each base-group is given with 2 or 3 related pictures and discuss whether such western sayings about food are true or false. Then each base-group sends a member to give the final correct meanings about the sayings about food. Finally, members think of some Chinese sayings about food and discuss whether they are true or not.

1. Water with meals is fattening
2. Brown eggs are better than white
3. Carrots make you see in the dark
4. Fish is good for the brain
5. Crusts strengthen your teeth
6. Burnt toast makes your hair curly
7. A glass of milk helps prevent you getting drunk
8. Eating grapefruit helps you slim
9. An apple a day helps keep the doctor away
10. Apples clean your teeth

1.2 Nutrition Sentences Completing *(Anspaugh DJ, 1998)*

What: members complete nutrition-related statements with their own feelings and beliefs.

How: 6-7 members form a group and each group is given with a paper and an envelope containing paper strips with sentences. They draw a strip from the envelope one by one and complete that sentence with his or her feeling and experience. One of the members in each group is responsible to be the recorder.

- ✧ The most important meal of the day for me is...
- ✧ Eating a good breakfast is...
- ✧ My favourite foods are...
- ✧ Eating right means...
- ✧ I think that my present diet is...
- ✧ Between-meal snacks should be...
- ✧ One problem about nutrition for me is...

End the first workshop by celebrating members' hard work and making a lot of new friends

Workshop 2—Basic nutrients Needs for People

Aim

After this workshop, the members will:

- ✧ Know the six groups of food and the six essential nutrients that the body requires.
- ✧ Know which types of food contain more fat and the basic characteristics of fat.
- ✧ Begin to think the problems caused by modern diet.
- ✧ Taste different kinds of icy food.

Schedule (Time: 91minutes)

Greeting	*3 min*
Ice-breaking game 1 Chef Cooking	*10 min*
Ice-breaking game 2 BINGO	*15 min*
Activity 2.1 Categories	*10 min*
Activity 2.2 Fatty-Boom-Ba-Latty	*15 min*
Activity 2.3 Eating is Blessing	*25 min*
Activity 2.4 Food tasting—icy food	*10 min*
Administration	*5 min*

Greeting

Members greet and welcome other members and share "what have you eaten form yesterday to now?", "do you have breakfast today?" and "Are you prepared for this workshop?"

Ice-breaking game 1 Chef Cooking

What: members play for warming up

How: each member is given with a food card representing him/her. They sit in a big circle with one member to be the "Chef" standing in the middle. The "Chef" walks around and calls out the foods he/she likes to cook with and the one of that food needs to walk out and follow the "Chef" in a line. When the "Chef" thinks that there are enough foods, he/she calls out "serve" and all people have to find a seat. The one without a seat becomes the next "Chef".

Ice-breaking game 2 BINGO

What: members make new friends through interview game

How: each member is given with a paper dividing into nine boxes. They interview with nine new friends about the class they come from and the food they like most. They need to write down the answers in the boxes and ask the interviewees to sign in corresponding boxes. After they have finish, the leader draws a name card randomly and asks that member to introduce himself/herself. Members who have interviewed him/her can put a circle on the box with his/her signature. The leader continuous to draw name cards until someone can put three circles in a line (horizontally, vertically or diagonally). The one(s) who can put three circles in a line shout(s) out 'BINGO' and win(s).

2.1 Categories *(Toner, 1993)*

Concept: there are six groups of food and six essential nutrients that the body requires.

What: members identify foods in the proper nutrient categories.

How: divide members into two teams and give each member a food card (adopted from the previous game). Each team send a member to the board, one at a time, to stick his or her card on the

board under the proper category heading: (1) cereals; (2) fruits; (3) vegetables; (4) meat, egg, dry bean, and tofu; (5) dairy; and (6) fat, salt and sweet. The first team to have all its members sitting in their seats and all their cards in the correct categories is declared the winner. The leader checks the answers and tells which nutrients each group provides (vitamins, minerals, proteins, carbohydrates, fats and water). It is reminded that one food may contain more than one nutrient and we should eat different varieties of food so that we can *get al*l the nutrients we need.

2.2 Fatty Boom-Ba-Latty *(Toner, 1993)*

What: members identify foods containing more fat

How: each member is provided with a worksheet with 24 food items (two in a group). Members place an X in appropriate box indicating which food they think contains more fat. After that, each of them is given with a nutrition fact sheet to find out the actual fat content of that particular food and discuss and the answers with others. The leader checks the answers, appreciates the ones with all the answers correct and emphasises that some foods that we think is not fattening may contain much fat.

2.3 *Eating is blessing.* Dir. Siu King Lo. RTHK, 1993.

What: video discussing the problems caused by modern diet which is high in fat, cholesterol, but low in fibre, as well as some suggestion for healthy eating.

How: members need to answer the T/F questions below during watching the video. They discuss the answers within the base-groups, and then the leader checks and discusses the answers with them.

- The blood cholesterol of the children in Hong Kong is ranked as no. 1 in the world. (False)
- Thin children will not be suffered from high blood cholesterol. (False)
- Low-density-cholesterol is bad to our health. (True)
- high-density-cholesterol is good to our health. (True)
- Childhood obesity will lead to adulthood obesity. (True)
- Obesity is a risk factor of cancer, diabetes, stroke and heart disease. (True)
- Thin children must be suffered from parasite. (False)
- Children should not eat any fried food so as to prevent obesity. (True)

2.4 Food tasting

What: members taste and compare the fat content of ice-cream, frozen yoghurt and scrappy ice.

How: leader shows three kinds of icy food (ice-cream, frozen yoghurt and scrappy ice) and recommends the low-fat choices to the members (emphasises the importance of reading food label as well). Members taste and enjoy the food.

Administration—preparing for forming the base-group

Each member is given with a "base-group partner preference form" and they have to fill in the name of a member they would like to work with; or choose to work with any members. The leader will assign the members into base-groups of five according to their preference and the idea of randomisation.

End the second workshop by encouraging the members to choose low fat food and celebrating members' hard work.

Workshop 3—Basic Nutrients Needs for People

Aim

After this workshop, the members will:

- ✧ Form the base-groups.
- ✧ Know the functions and food sources of various minerals, fiber, fat, starch, water and protein.
- ✧ Practice 'Jigsaw' procedure to learn various nutrition news
- ✧ Evaluate workshop 2 and 3.

Schedule (Time: 90 minutes)

Base-group meeting	*10 min*
Activity 3.1 Matching Minerals	*10 min*
Activity 3.3 Super Big TV	*25 min*
Activity 3.4 Reporter	*35 min*
Evaluation	*10 min*

Base-group meeting

Members greet within the newly formed base-groups and decide a food name to represent the group. These base-groups will last for the whole programme while many activities and administration will be performed according to these groups. They discuss which food they dislike within the base-group and the leader interviews with some of them and discusses with the whole class.

3.1 Matching Minerals *(Toner, 1993)*

What: members understand the functions and food sources of various minerals through card-matching game.

How: each group is provided with one set of Matching Minerals Cards. One the signal, each group tries to match the mineral with its functions and its food sources. The first group to correctly match all minerals is the winner. The leader goes through the correct answers one by one.

3.3 Super Big TV

What: members learn the functions and food sources of different nutrients (fibre, fat, water, protein and starch) through guessing game.

How: one base-group sits back to the screen while the others sit in a big circle. The leader project a vocabulary on the screen and the group sitting back to the screen sends a member to act the vocabularies while the other members in the same group have to guess the vocabulary. The acting members can describe the vocabulary with out saying the exact words. When they guess correctly or want to pass, the leader shows the next one and sees how many vocabularies they can guess correctly in two minutes. After one base-group has finish, the leader gives the transparency with the vocabularies to them. They need to connect the phrases into a meaningful paragraph which is about the functions or food sources of a specific nutrient (with the help of the pictures beside and the hints given by the leader). Next base-group takes turns to guess another group of vocabularies. After all group have guessed the vocabularies and constructed the paragraph, each base-group sends a member to introduce the paragraph to the

whole class and the leader clarifies the mistakes and stresses the importance of that particular nutrient.

3.3 Reporter

What: members report what they have read and learned from the article about different nutrients to other members by adopting the "Jigsaw procedure" (Johnson D, 1991)

How:

1. Members sit in base-groups (five in a group). The leader provides each group with one set of reading material about nutrition (containing five newspaper cuttings) and assigns each member to have one newspaper cutting.
2. The leader asks members to form 'preparation groups' with other members who have the same newspaper cutting they do (3-4 in a group). They should read and learn to become an expert on their newspaper cutting and plan how to teach their part of the material to the other members of their groups. They use the pair reading procedure: (a) members silently read each paragraph; (b) one member summarises its meaning while the other members check the summary for accuracy, and (c) the members take turns after each paragraph. In doing so members should list the major points they wish to teach.
3. Members practice teaching their part of the reading material within the 'preparation groups', listen carefully the their partner's practice, and incorporate the best ideas from the other's presentation into their own. The cooperative goal is to ensure that all members are practiced and ready to teach.
4. Members return to their base-groups. They need to teach area of expertise to the other group members and learn the material being taught by the other members, while the goal is to ensure that members master all parts of the assigned material.

Evaluation (for workshop 2 and 3)

Members discuss either question 1, 2 or question 3, 4 within the base-groups, express their opinion through writing or drawing on A3 paper. They post their answers around the classroom and share with other members.

Question 1: please try to remember the activities in workshop2 (date), which session is the most impressive and why? (The activities in workshop 2 include: Chef Cooking, Bingo, Eating is blessing video, fatty-boom-ba-latty, categories and food tasting)

Question 2: List the important point(s) that you have learned today.

Question 3: please try to remember the activities in workshop2 (date), which session needs improvement the most and why? (The activities in workshop 2 include: Chef Cooking, Bingo, Eating is blessing video, fatty-boom-ba-latty, categories and food tasting)

Question 4: List the healthy eating rule(s) (you have learned today) that you wish to apply.

End the workshop by celebrating members' hard work.

Workshop 4—Basic Nutrients Needs for People

Aim

After this workshop, the members will:

- ✧ Understand the benefits of eating vegetables and be encouraged to develop healthy eating habit.
- ✧ Have an opportunity to report or act on some information about the influence of fat, sugar, dietary fibre and salt to our health.

Schedule (Time: 90 minutes)

Activity 4.1 Nutrient Catwalk *1.5 hr*

4.1 Nutrient Catwalk

What: members research various nutrients and their food sources and display the findings visually in a fashion show.

How: Base-groups research on the assigned nutrient, design a T-shirt to display their findings and prepare the materials needed before the workshop. During the workshop, present the T-shirt to other members in a fashion show. The one with the best performance is declared the winner.

End the workshop by celebrating members' hard work.

Workshop 5—Factors affecting our diet

Aim

After this workshop, the members will:

- ✧ Consider the factors affecting their eating pattern and whether they can control these factors.
- ✧ Analyse how their emotion affecting their eating.
- ✧ Be encouraged to make dietary change so as to keep their body healthy.

Schedule (Time: 80minutes)

Activity 5.1 The factors influencing eating *35min*
Activity 5.2 Eating and Emotion *25 min*
Activity 5.3 Mirror, mirror on the wall—what will I be like in 20 years' time? *20 min*

5.1 The factors influencing eating *(modified from Health Education Authority, 1990)*

What: members discover what factors influencing their eating and estimate whether these factors can be controlled by them.

How: Divide the members into 4 or 6 groups, give each group a large sheet of paper and ask them to draw a framework about the factors affecting their eating habits (economic, locality, ethnic customs, knowledge, media, family, religion, availability, personal beliefs, ability, weight, time available, peer pressure, facilities for storing food or cooking). Each group shows and reports their framework and discuss whether these factors can be controlled by them (by feeling the following table).

Factor	Have full control	Have some control	Have no control	How to control if you want to make changes?
Peer(e.g.)		✓		

5.2 Eating and Emotion *(Toner, 1993)*

What and How: members fill in the quiz of "Eating and Emotion" and estimate how their eating habits are influenced by their emotion.

5.3 Mirror, mirror on the wall—what will I be like in 20 years' time? ***(modified from Health Education Authority, 1990)***

What: Members are encouraged to make lifestyle changes through imaging what they will be like in the future

Materials: >10 photos of different mid-aged people (e.g. obese housewife, thin lady, fat businessman, and sick patient)

How: Divide members into small groups. Give each group some photos of different middle-aged people as for stimulation. Members imagine and discuss what will they be like in 20 years' time if their lifestyle (including eating pattern) remain unchanged. Further discuss the following questions:

1. Which person in the photos you think you will be like in the future?
2. What can you do to maintain your weight and to keep reasonably fit?
3. What attainment goals and strategies you should make so as to keep you healthy?

Workshop 6—Healthy Eating

Aim

After this workshop, the members will:

- ✧ Be familiar with the five categories in the Food Guide Pyramid
- ✧ Generate a Food Guide Pyramid poster for promoting healthy eating to other students

Schedule (Time: 70minutes)

Activity 6.1	*Healthy Lifestyle*	*30min*
Activity 6.2	*Making your own Food Guide Pyramid*	*40 min*

6.1 ***Healthy Living (kid version).*** **Dir. and Distributor CECES, 1994.**

What: members understand the importance of healthy eating following the food guide pyramid and the categories in the pyramid.

How: members watch the video about healthy eating following the food guide pyramid and the categories in the pyramid. Discuss further about the following aspects:

1. Serving size of each category
2. Some guidelines stressed in the video
3. The lyrics of the programme song

6.2 Making your own food guide pyramid *(Anspaugh, Ezel, 1998)*

What: members work as a group to make posters of food guide pyramid

How: each base-group is provided with glue, scissors, and magazines with food pictures and poster boards. Members cut out different foods from the magazines and paste them on the correct category in the Food Guide Pyramid it belongs to. Hang the posters around their own classroom.

Workshop 7—Healthy Eating

Aim

After this workshop, the members will:

- ✧ Be familiar with foods, which are low in sodium, fat, and cholesterol.
- ✧ Know the effects of foods, which are high in sodium, fat, and cholesterol to our health.

Schedule (Time: 55minutes)

Activity 7.1	*Food cards Questionnaire*	*20 min*
Activity 7.2	*The Pressure's On!*	*35 min*

7.1 Food cards Questionnaire *(Toner, 1993)*

What: members answer the following questions according to the Food Cards with nutrition facts of different foods.

How: members are divided into groups of four (no need to form the base-group) and give them a set of Food Cards, which is mixed. Members first identify the foods into appropriate group and then answer the following questions:

- ✧ Which ***group*** of foods is highest in sodium?
- ✧ Which ***food*** is highest in sodium?
- ✧ Which ***group*** of foods is lowest in carbohydrates?
- ✧ Which ***three groups*** are very low in cholesterol?
- ✧ Which food is highest in cholesterol?
- ✧ Which food is lowest in calories?
- ✧ Which ***two foods*** are highest in calories?
- ✧ Which vegetable is highest in carbohydrates?
- ✧ Which food from the meat group has the most fat? How much?
- ✧ Which food from the grains group is highest in sodium? Lowest?

7.2 The pressure's On *(Toner, 1993)*

Concept: Foods vary in the amount of sodium, cholesterol, and fat that they contain. Limiting the amount of these substances in the diet can help reduce the risk of heart disease.

What: members use Food Cards to play a game. The one with the least amount of sodium, cholesterol, or fat when the food cards are totalled is the winner.

How: divide the members into groups of six and give each group a set of Food Cards facing down. One at a time, in turn, each player draws a card, turns it face up and announces the food and the amount of sodium. That person keeps that card. Continue choosing and recording until all cards have been selected. Each player adds up the total amount of sodium and the player with the fewest milligrams is the winner. Shuffle and play again for cholesterol and fat. Again, the lowest amount of cholesterol or fat is the winner. Finally, discuss the effects large amounts of sodium, cholesterol and fat have on health.

End the workshop by celebrating members' hard work and encouraging the implementation.

Workshop 8—Diet Modification

Aim

After this workshop, the members will:

- ✧ Know the importance of eating variety of foods from all the food groups to maintain a balanced diet.
- ✧ Have an opportunity to develop skill in planning healthy menus for various situations.
- ✧ Observe other students' eating habits in a project work.

Schedule (Time: 80minutes)

Activity 8.1 Favourite Foods	*20 min*
Activity 8.2 Meal Planning	*30 min*
Assignment—Do they eat healthily	*30 min*

8.1 Favourite Foods *(modified from Toner, 1993)*

Concept: it is important to eat a variety of foods from all the food groups to maintain a balanced diet.

What: members determine if they eat foods from all the food groups.

How: each member is provided with Favourite Foods Fold-out. They circle all the foods they like. Have members fold the paper lengthwise and crease it. Then fold the paper into thirds and crease it. When the paper is unfolded, it should form six boxes representing the food groups. Then discuss the following questions within the base-groups:

1. Which food group has the most items circled?
2. Do you most often eat the foods that are healthy for you or those that are not?
3. Are all of the nutrients included in your diet or are some missing?
4. Which foods do you think you should add into your favourite category?
5. Which foods on your list do you think you should eliminate?
6. How else might we analyse your list?

8.2 Meal Planning *(Anspaugh, Ezell, 1998)*

What: members plan numerous menus for various dietary situations.

How: divide the members into groups of five and provide each group with one of the following situations to enact and then discuss each situation to the whole group and let see whether each menu fit in the food guide pyramid.

- ✧ Planning food to serve at a party for friends
- ✧ Planning breakfast menus for mornings when time for food preparation is limited
- ✧ Planning a dinner for a friend who is on a weight reduction diet
- ✧ Planning a dinner for a dinner menu for a family gathering
- ✧ Selecting different foods from a buffet or cafeteria line
- ✧ Planning a snack for 3 student after school

Assignment—Do they eat healthily?

What: members research on the eating pattern of other students

How: two base-groups join together to form a "cooperative group" and each "cooperative group" is assigned with a time and place. They need to research on what people buy or eat on that time and place. Each group finishes the worksheet and then reports the findings on the next meeting.

Time and place: tuck shop (before workshop), tuck shop (during recess), tuck shop (during lunch time), school canteen (during lunch), restaurant A (during lunch), restaurant B (during lunch)

Questions on worksheet:

1. For the tuck shop groups, what people buy in 15 minutes? Please construct a bar chart to show your findings.
2. For the school canteen groups and the restaurant groups, which types of food students usually choose? Please take some statistics and construct charts to show your findings.
3. Why they choose these foods? Ask 1 or 2 students for their opinions?

End the workshop by encouraging members' hard work. Give an advertisement on the newsletter talking about how to read the food label.

Workshop 9—Diet Modification

Aim

After this workshop, the members will:

- ✧ Have an opportunity to share and report what they have observed from the project "Do they eat healthily?"
- ✧ Compare the eating habits of other students and determine their diets are healthy.
- ✧ Consider some modifications for improving our diets as well as others' diets.

Schedule (Time: 60minutes)

Activity 9.1 Report on the Project "Do they eat healthily?"	*50 min*
Base-group meeting	*10 min*

9.1 Report on the Project "Do they eat healthily?"

What: students report the findings in the project "Do they eat healthily?" to the whole group and discuss the nutrition problems and suggest some modifications.

How: each group presents their findings about the eating pattern of other students to the whole group. Then discuss the following questions:

1. Is it any differences in the buying pattern between "before workshop" and "during recess" in the tuck shop?
2. Is it any differences in the students' preference of lunch between restaurant A and B?
3. How about the lunch provided by the school? Do students like it?
4. Do they eat healthily? Why? Do these food products or lunch provide enough nutrients from all categories in the food guide pyramid in a suitable proportion?
5. Are there any modifications we can make?

Base-group meeting

Members discuss and write down their opinions towards the following areas on big paper. Post the paper around the room and share with other members.

- ✧ List at least three implementations of diet modification in you real life
- ✧ List the possible barriers when implementing these plans, any solutions?

Workshop 10—Weight Control

Aim

After this workshop, the members will:

- ✧ Know their BMI and BMR.
- ✧ Know the concept of healthy body weight range and the concept of calories.
- ✧ Understand the health problems related to obesity.
- ✧ Have a chance to test their knowledge of healthy dieting
- ✧ Know some hints or guidelines to control weight safely.

Schedule (Time: 70minutes)

Activity 10.1	*Estimating BMI and BMR*	*15 min*
Activity 10.2	*Energy Expenditure*	*20 min*
Activity 10.3	*Hazards of Obesity*	*20 min*
Activity 10.4	*Weight Control Hints*	*15 min*

10.1 Estimating BMI and BMR *(Toner, 1993)*

What: members estimate their BMI and BMR discuss the concept of healthy body weight range

How: guide members to calculate their BMI [weight (kg)/height^2 (m^2)] and discuss the concept of healthy body weight range. Provide each member a worksheet of Calories and BMR. Guide members to estimate their BMR and discuss the concept behind. Further discuss the following questions:

1. How is it possible to have a high calorie/low nutrient diet?
2. Does an active person need more or fewer calories per day? Explain.
3. How might outside air temperature affect calorie burning?

10.2 Hazards of Obesity

What: members understand the hazards of obesity through "act-and-guess" game

How: divide members into 2 groups. One group sends a member to act an assigned phrase related to obesity without saying any words. His/her group members guess what the phrase is. Then the other group sends a member and act in turn. The time needed for the group to guess the phrase correctly is recorded and accumulated. After the game, discuss and summarise the hazards of obesity and encourage them to keep their weight healthy. The group use less total time to guess all the phrases correctly is the winner. Some suggested phrases are:

- ✧ Adipose tissue
- ✧ Diabetes
- ✧ Heart disease
- ✧ Strain on the circulatory system
- ✧ Hardening of the arteries
- ✧ High blood pressure
- ✧ Gallbladder and liver ailments
- ✧ Arthritis
- ✧ Strokes

10.3 Weight Control Hints *(Toner, 1993)*

What: discuss some guidelines or hints for controlling the weight safely.

How: provide each student with the worksheet of "Weight Control Hints. Discuss the points listed and add some suggestions of how to control the weight safely.

End the workshop by celebrating members' hard work and encouraging for correct body image.

Workshop 11—Healthy Cooking Workshop

PRE-WORKSHOP

Aim

After this pre-workshop, the members will:

- ✧ Know the skills to modify recipes to be healthier.
- ✧ Have an opportunity to practice healthy cooking

Schedule (Time: 30 minutes)

Activity 11.1 Recipe Raiders *30 min*

11.1 Recipe Raiders *(Toner, 1993)*

Concept: some recipes contain foods from all the food groups and some are lacking in certain groups.

What: members analyse recipes and see what can be added to make a meal that has foods from all food groups.

How: provide each member with one set of recipes. Use the Worksheet—Recipe Analysis Chart to determine which food groups are represented and which are not. Ask students to add foods to a menu to provide a balanced meal. Members are than divided into groups (6-7 per group). Each group have to design a healthy dish, must including the ingredient they have drawn. They have to prepare and bring the ingredients needed in the following workshop.

WORKSHOP

Aim

After this workshop, the members will:

- ✧ Be familiar with menu planning and buying food in the market
- ✧ Have and opportunity to practice healthy cooking.

Schedule (Time: 2 hours)

Activity 11.2 Healthy cooking competition *2 hr*

11.2 Healthy Cooking Competition

What: members prepare and cook the healthy dishes designed by themselves for a competition.

How: after each group has bought all the ingredients they need, they prepare and cook the dishes. Then the adjudicators will try the food and choose which group is the winner according to the taste, colour, aroma and nutritional values of the dishes. Members enjoy the dishes at the same time!

End the workshop by celebrating members' hard work and enjoying the food

Workshop 12—Evaluation

Aim

After this workshop, the members will:

- ✧ Have an opportunity to measure their changes in nutrition knowledge, attitude and behaviour.
- ✧ Have an opportunity to share their feelings about the club.

Schedule (Time: 60 minutes)

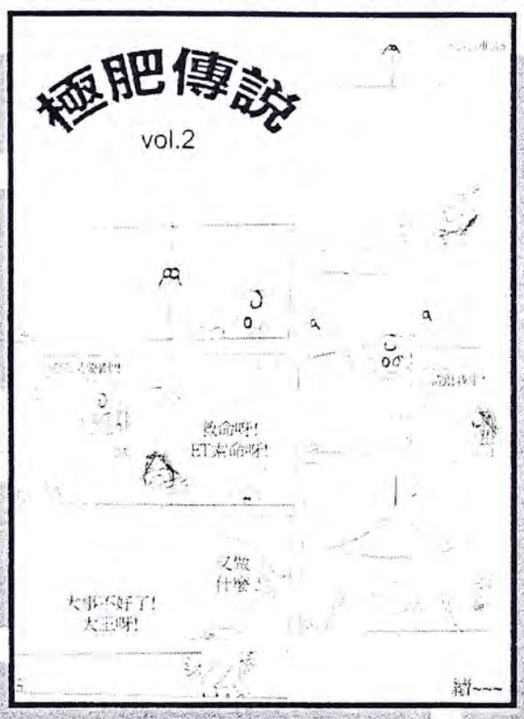
Activity 12.1 HCC and You *60 min*

12.1 HCC and You

What: members share and evaluate what they have learned from the workshops.

How: members complete post-questionnaire and then share what they have learned from the activities and what improvements shall be made.

Appendix C: Sample of newsletter "Town of Health" (black and white in A4 size)



引起肥胖的原因

文/XX XXXXXXXXX 中山大學

1 體內脂肪細胞增多

脂肪細胞數目和細胞內脂肪含量的多寡決定人身體的胖瘦。成年後開始肥胖或是在短時間內肥胖的主要是因爲脂肪細胞肥大，但其體內的脂肪細胞數目沒有大的增加。相反，從孩童開始肥胖或者是從極瘦和以前一樣胖的人士，他們體內的脂肪細胞不但體積增加細胞數量同樣增加。

2 熱量吸收太多

脂肪

日常食物中的脂肪，消化後進入血液中，一部分變成熱量，一部分成爲細胞物質或其它物質，用不完的便儲存起來成爲脂肪細胞。脂肪細胞容量越多，身體越胖。脂肪過多，體內脂質過高，容易阻塞血管，所以要減肥就必須不攝取多或太少

糖類

大家都知道吃糖果、巧克力、甜品是會令人肥胖的，這兩類食物更能抵抗飢餓，奪取動力來源的糖類，而許多蛋白質食物多時，熱量是熱量的主要來源，甲不過時也就會轉變成爲脂肪，使人肥胖

3 遺傳因素

據統計，父母兩肥胖的人，他們的子女有70%機會肥胖，而若父母體型都是瘦或正常的，子女肥胖的機會只有10%。

4 熱量的耗盡少

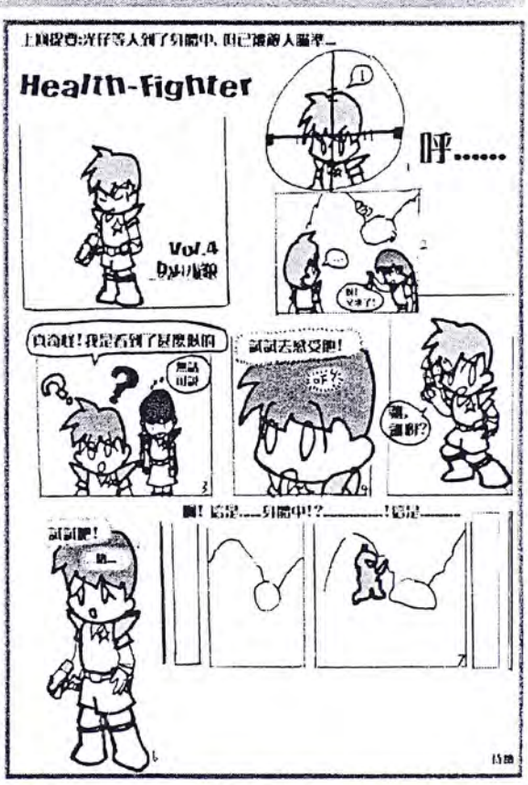
肥胖的人食量不一定比體重正常的人多，可是肥胖的人大多是活動量較少的，肥胖的人雖然吃得不太多，然而，活動和新陳代謝，就會造成過重，相反，多活動的人，像運動員和搬運工人，他們雖然吃得很多，但由於他們的體力消耗大，使這有過多的熱量可以轉化成脂肪了，所以，儘管他們吃得多，也不會變成胖子

5 放食習慣

我們吃了東西，就會感到飽和滿足，就不想再吃，但有些人特別饞嘴，見到美食當前會忍不住，雖不感到肚飢也會大吃一頓來滿足自己或發洩情緒，這也是做成肥胖的另一個原因！

此外進食的次數少，卻一次過吃很多的人是較容易肥胖的，還有喝酒也會影響發胖，酒精所產生熱量很高，一克便相等於七大卡，喝啤酒更易令人肥胖，因爲當中的啤酒花會刺激食慾，使人吃得更多。

總而言之，肥胖不是一個簡單的問題，但當中大部分原因是由不健康的生活習慣導致的，我們應多加注意，才能擁有美好的身段和健康的人生。



食物的新發現

文/XX XXXXX XXXXXXXX中大

原來番茄可以防癌症的機會，根據「癌症研究活動」所說，在日本、挪威和西班牙進行的72項研究中，有57項顯示吃番茄與減少癌症發生之間是有關聯的，而這些研究對腸癌、胃癌具特別意義，研究員說，番茄癌症的特性來自番茄紅素(Lycopene)一存在於番茄表皮的抗氧化劑。

另外，亦有研究顯示，黃豆在癌症的預防和治療上有顯著的功效，最近科學家從長息蕊分泌中分析出能夠抑制癌症的成份，其中包括最新發現的 Inositol Hexophosphate (IP-6)。許多多的研究支持IP-6的抗癌的特性，和它治療腎石和降血脂的能力。

還有一生育協結果，發現沒有長期做肢體的實驗室老鼠患上乳癌症，原來我們常喝的綠茶中含有「抗氧化酵素」，可預防乳癌症，因此中國、日本、印度等國家的人患乳癌症的比率遠低於西方，然而西方國家對於治療乳癌症做了正確報導，至今尚未找到更有效的治療方法。

多謝大家一直以來對「漫畫慢遊」和投稿園地的支持，除了Health-Fighter，今期還加入了肥妹「小小」。想知小神仙帶了她到什麼地方？ Health-Fighter 的遭遇如何？請留意下學年有可能繼續出版的「漫畫慢遊」。

減脂之旅 2

美食廣場

怎樣吃最少油？

在家用膳：先吃菜，再吃肉，多吃蔬菜，不加不必要的佐醬

預備小食時：選粉及麵類的食物含油量高，要少吃

在酒樓食肆：吃湯麵時不要把湯喝完，不要加麻油、豬油，喝湯時要撇掉浮油

在蛋糕屋：除去蛋糕中間及夾層的忌廉

在雪糕屋：選擇低脂產品

在甜品屋：多吃水果，少吸果汁

在快餐店：炸雞、薯條、漢堡包、魚柳包、薄餅等食物含油量高，要少吃

油味烹飪教室

美味雞

原材料：
連皮雞胸肉2件
豆粉200克
油2.5杯

原做法：
雞胸肉沾豆粉，油炸至金黃

變

美味雞

材料變化：
雞胸去皮

做法變化：
1.將雞胸燙熟，切皮細絲，拌冷
2.混合醬油、醋、糖，淋在雞絲上

- 菜農的外皮及可見的肥肉通常含有較高的脂肪量，去掉外皮可減少脂肪的攝取
- 將肉類切成細絲狀或片狀，可以減少油的使用量
- 用乳酪、檸檬汁或醬來代替沙律醬，在烤肉時，用酒、菠蘿或雞尾酒來增味，少用油炸

油味烹飪教室

怎樣煮最少油？

紅燒獅子頭

原材料：
五花腩肉300克
蛋1隻
油2杯

原做法：
將做好的肉丸下油鑊，炸至金黃色

變

新紅燒獅子頭

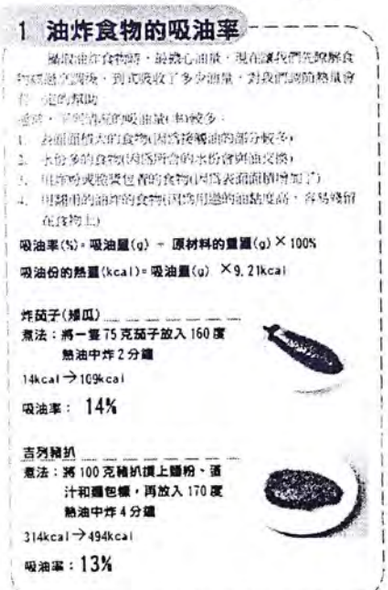
材料變化：
1. 以豬後腿肉代替
2. 肉用量減少，加入豆腐、雜菇或蘑菇、蘿蔔、豆、筍等
3. 加入蔬菜拌菜

做法變化：
1. 肉丸用平底鑊煎或焗至金黃
2. 凡予煮熟後，再淋上紅燒汁

- 選擇脂肪量較少的肉類，例如雞肉、瘦肉肉、牛腩肉、牛腱
- 加入脂肪較少的食物，減少被肉用量
- 使用蔬菜、水果、海藻等來增加份量及纖維量
- 使用易潔鑊具、烤箱、微波爐等用具，可減少用油量
- 採用蒸、煮、烤、滾等低油烹調法，少用油炸

不同烹調方法的熱量

1 油炸食物的吸油率



通常油炸食物時，最關心油量，現在讓我們先來解食物吸油之調味，到底吸收了多少油量，對我們的熱量會有一定的幫助

通常，下列情況的吸油量(率)較多：

1. 表面面積大的食物(因為接觸油的部分較多)，
2. 水份多的食物(因為所含的水份會與油交換)，
3. 用炸或煎要包着的食物(因為表面面積增加了)，
4. 用調用的油炸的食物(因為用過的油黏度高，容易殘留在食物上)

吸油率(%)=吸油量(g) ÷ 原材料的重量(g) × 100%

吸油份的熱量(kcal)=吸油量(g) × 9.21kcal

2 材料的切法與吸油率

食物切得越細，表面面積就越大，由於與油的接觸面積增加，雖然烹調時間短，吸油率也很驚人，讓我們看看在炸薯仔時，不同的切法對吸油的容量有什麼變化。

煮法：將50克薯仔連皮切成4份，然後炸熟

39kcal → 48kcal

吸油率：2%

煮法：將50克薯仔連皮切成條狀，然後炸熟

39kcal → 67kcal

3 炒蔬菜時，蔬菜的特性和切法也會影響油的使用量和入口量

要控制可口又不致於油膩，重要的是如何掌握用油量，一般菜太少時，炒出來的菜味比熱度不好吃，自己可能感覺，有些還未熟透，相反，油量過多時會使整道菜「油浸浸」的，很難入口。

蔬菜的特性和烹調法也會影響油的使用量和入口量，例如一味青椒，面積大要切成條的蔬菜比較容易吸油，但一味絲的且肉厚或爽口的蔬菜則比較難吸油了，請看右邊的例子。

柔軟的蔬菜

煮法：將200克菠菜和16克油下中式鑊鏟，大火炒1分30秒

50kcal → 175kcal

用油量：16g

入口的油量：13.6g

實際油份攝取率：85%

厚肉的青椒(切角)

煮法：將200克青椒和30克油下中式鑊鏟，大火炒1分30秒

42kcal → 188kcal

用油量：30g

入口的油量：15.8g

實際油份攝取率：53%

青椒(切絲)

煮法：將200克青椒和16克油下中式鑊鏟，大火炒1分30秒

42kcal → 136kcal

用油量：16g

入口的油量：10.2g

實際油份攝取率：64%

過了以上這幾例外，油的質料和形狀也會改變用油量，例如比薄餅需要少些油，而中式煎炒比平底鑊需要少些油，原來要煮一碟既好味又健康的菜有不簡單呢！

恭喜你完成「減脂之旅」，你有沒有發現自己比以前更有精神呢？其實當你實踐「減脂之旅」的建議，持之以恆，伸extend物就會送到你身上，那就是「健康」，不是每個人都需要減肥，但是飲食中的減脂行動卻是每個人都要做的，在飲食中少一些脂肪，身體就會多一分健康，歡迎大家一起來探索減脂巴士，邁向健康之路。

減脂之旅

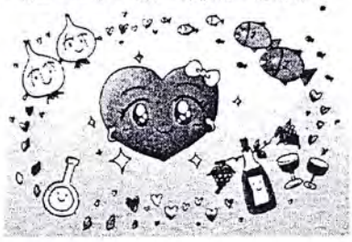
怎樣預防心臟病？

健康飲食與心臟病

要預防心臟病，最有效的方法就是減少吃來自動物的飽和脂肪（它們會提高血膽固醇，使血管容易阻塞），和多吃含豐富抗氧化物的食物，因為它們能減低有害物質對動脈的傷害。

能夠挽救動脈和預防心臟病的食物：

海鮮、水果、蔬菜、堅果、穀類、洋蔥、大蒜、橄欖油、適量的酒、含有高量維他命C、維他命E和β-胡蘿蔔素的食物。



對動脈和心臟病有害的食物：

含有高量飽和脂肪的肉類和乳製品，過量的酒。

魚是預防心臟病最佳的食物

大蒜能夠修補受過傷的動脈

你還要

- 定期量度血膽固醇、血糖和血壓指數，並維持在正常健康範圍之內
- 保持體重和體內脂肪比例在正常水平
- 多做運動，並建立一個定期運動計劃
- 戒絕吸煙／二手煙
- 保持心境開朗

地中海克里特島上的居民有時會喝下一杯一杯的橄欖油。研究發現，在十五年之內，每10000名居民之中只有38人是死於心臟病（美國卻是773人）。其他地中海地區人民的患病率也很低。他們飲食中的「單一不飽和脂肪」（橄欖油的主要成分），就是預防各種疾病的關鍵。難怪橄欖油有時候被稱為「長壽食品」。

橄欖油能保護心臟，皆因它對動脈比較友善，能夠減少「壞膽固醇」（低密度膽固醇），而不會減少「好膽固醇」（高密度膽固醇）。此外，它的抗氧化物能防止動脈受到「壞膽固醇」的傷害。

食物身份證

人有人的身分證，沒想到食物也有啊！真有趣！相信我可以種食物的身分證更認識這個食物，更容易選擇。

這一種餅乾一片有80大卡，我吃四片就是320大卡

脂肪佔熱量百分比 4克 x 9大卡/克 x100% =45%
80大卡

大卡

這是由蛋白質、碳水化合物和脂肪所提供的能量。我們相當多一些來自碳水化合物的能量，而少一些來自脂肪的能量會更健康。

蛋白質

一克蛋白質相等於4大卡。

脂肪

一克脂肪相等於9大卡。5克脂肪大約等於1茶匙油、牛油或植物牛油。

飽和脂肪及反式脂肪

對於那些特別註明低（無）飽和脂肪的食品，這是必須細明的標籤。一些食物類，雖如相當上食品被飽和的食物根本沒有食物標籤，但一些標籤是「低（無）膽固醇」的食品可能含有許多更能使血膽固醇升高的「飽和脂肪」。

成分

這是按產品所用的材料的重量大小而順序列出來的，以便我們比較（特別在沒有列出營養標示的時候）。

品名	餅乾
成分	麵粉、植物油、砂糖、芝麻
添加物	食用色素黃色五號
製造廠家	OO食品股份有限公司
地址	香港大埔工業村OO號
製造日期	2001.07.10
保存期限	三年

營養標示		
每一份量		15克
本包裝含		12份
	每份	每100克
熱量	80大卡	533大卡
蛋白質	1克	6.7克
脂肪	4克	26.7克
膽固醇	0克	0克
碳水化合物	10克	66.7克
鈉	10毫克	66.7毫克
食用纖維	0克	0克

碳水化合物

一些標籤更列出不同種類的碳水化合物，如糖、澱粉和膳食纖維。1克碳水化合物或纖維等於4大卡。

鈉

可幫助我們每天吃少於3000毫克的鈉。1茶匙食鹽等於2300毫克鈉。

食用纖維

五穀類、蔬果和果仁均含有食用纖維，一些每份含有3克或以上食用纖維的食品都是很好的來源。

營養食譜

總編輯：
姜英雲小姐（健康關注學會導師）

編輯委員會顧問：
李大坡教授（健康教育及促進健康中心）
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王xx (4A)
余xx (2B)
陳xx (4D)
李xx (4D)

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蘇xx (3B)　陳xx (2C)
杜xx (3B)　陳xx (2A)
劉xx (3B)　王 xx(2A)
黃xx (3B)　邁xx (2C)

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Appendix D: The Questionnaire used in the study at baseline and follow-up

健康關注學會問卷調查

第一部分　請選出你對以下句子的同意程度 （答案並沒有對與錯之分）

		非常不同意	少少不同意	無意見	少少同意	非常同意
1	我有興趣知多一些有關營養的知識	1	2	3	4	5
2	我沒有時間理會我的飲食問題	1	2	3	4	5
3	選擇我所吃的食物是我的責任	1	2	3	4	5
4	當我長大後才會關注我的飲食問題	1	2	3	4	5
5	我能控制我吃零食的習慣	1	2	3	4	5
6	培養良好的飲食習慣是一件令人煩惱的事	1	2	3	4	5
7	我現時很健康，無須注意飲食的問題	1	2	3	4	5
8	當我吃太多不健康的零食（如薯片和汽水）時，心裡覺得不太舒服	1	2	3	4	5
9	認識我所吃的食物多一點，對我來說是一件重要的事	1	2	3	4	5
10	若我能小心選擇食物，將來會更健康	1	2	3	4	5
11	我能實踐和培養健康的飲食習慣	1	2	3	4	5
12	當我的飲食正確，心裡有一份滿足感	1	2	3	4	5
13	我不介意我所吃的食物的成分是什麼	1	2	3	4	5
14	在過去一年內，我曾經以節食來減輕體重	1	2	3	4	5
15	我不滿意現時的身型和體重	1	2	3	4	5
16	我會實踐和培養健康的飲食習慣	1	2	3	4	5

第二部分以下是關於營養知識的調查，並不是一項測驗，所以請儘量回答。若不清楚正確的答案，請選「不知道」。

2.1 營養專家的建議

1. 你認爲專家建議人們應「吃多些」、「吃一樣份量」或「吃少些」以下的食物？（每項食物選一次）

	吃多些	吃一樣份量	吃少些	不知道
蔬菜	❑	❑	❑	❑
高糖份食物	❑	❑	❑	❑
澱粉質食物	❑	❑	❑	❑
肥膩的食物	❑	❑	❑	❑
高纖維食物	❑	❑	❑	❑
生果	❑	❑	❑	❑

2.2 食物營養素的比較

2. 以下哪一種食物是鐵質的最好來源？
   - ☐ 紅蘿蔔
   - ☐ 菠菜
   - ☐ 士多啤梨
   - ☐ 魚
   - ☐ 不知道

3. 以下哪一種食物是碘質的最好來源？
   - ☐ 魚
   - ☐ 西蘭花
   - ☐ 牛腩
   - ☐ 牛奶
   - ☐ 不知道

4. 你認爲以下的食物屬於高脂肪還是低脂肪？

	高脂	低脂	不知道
午餐肉	❑	❑	❑
蜜糖	❑	❑	❑
果仁	❑	❑	❑
麵包	❑	❑	❑
薯片	❑	❑	❑

5. 你認爲以下的食物屬於高鹽份還是低鹽份？

	高鹽份	低鹽份	不知道
香腸	❑	❑	❑
罐頭湯	❑	❑	❑
芝士波	❑	❑	❑
薯片	❑	❑	❑
克力架餅乾	❑	❑	❑

6. 一杯全脂奶的蛋白質含量高於一杯脫脂奶。

❑ 同意
❑ 不同意
❑ 不知道

7. 哪一種麵包含有最多維生素和礦物質？

❑ 白麵包
❑ 麥包
❑ 全麥包
❑ 不知道

8. 你認爲以下的食物屬於高纖維還是低纖維？

	高纖維	低纖維	不知道
香蕉	❑	❑	❑
雞蛋	❑	❑	❑
牛肉、豬肉	❑	❑	❑
西蘭花	❑	❑	❑
魚類	❑	❑	❑

2.3 選擇食物及控制體重

請選出你認爲正確的答案，不要根據你是否喜歡該種食物！例如:

例：「某人想減少飲食中的脂肪，以下哪一種牛奶會是最佳選擇？」

a 全脂奶 ❑
b 低脂奶 ❑
c 脫脂奶 ❑

假如你*不喜歡*喝脫脂奶，卻知道這是正確答案，你仍然須要選脫脂奶。

9. 以下的減肥方法健康嗎？

	健康	不健康	不知道
每星期做三次運動	❑	❑	❑
進食時，慢慢嘴嚼	❑	❑	❑
早、午餐只吃生果	❑	❑	❑
不吃早餐	❑	❑	❑
不吃澱粉質的食物	❑	❑	❑

10. 以下關於厭食症的句子是正確嗎？

	正確	不正確	不知道
厭食症可導致營養不良、頭髮脫落、心臟病和自殺問題	❑	❑	❑
厭食症是指人因恐懼肥胖而不願進食，導致體重不斷下跌	❑	❑	❑

11. 以下哪一句關於快餐店膳食的句子是正確的？

- ☐ 太少碳水化合物
- ☐ 太少鹽分
- ☐ 太少脂肪
- ☐ 太多食物纖維
- ☐ 不知道

12. 以下哪一款午餐是低脂、高纖維的最佳選擇？

- ☐ 燒雞
- ☐ 全麥包夾芝士
- ☐ 全麥包夾焗豆
- ☐ 雜菜沙律(加沙律醬)
- ☐ 不知道

13. 某人想減少飲食中的脂肪，以下哪一項會是最佳選擇？

- ☐ 燒牛扒
- ☐ 燒香腸
- ☐ 燒雞胸肉
- ☐ 燒豬扒
- ☐ 不知道

14. 某人想減少飲食中的鹽份，以下哪一項會是最佳選擇？

- ☐ 至尊牛肉 pizza
- ☐ 海蜇燻碲
- ☐ 蘑菇庵列
- ☐ 蠔油菜心
- ☐ 不知道

2.4 健康問題及疾病

15. 你認識任何關於「進食脂肪的份量」的健康問題或疾病嗎？

- ☐ 認識
- ☐ 不認識
- ☐ 不知道

如果認識，你認爲什麼健康問題或疾病與「進食脂肪的份量」有關呢？

✍ _____

_____

_____

16. 你認爲以下的飲食建議能幫助預防心臟病嗎？

	能	不能	不知道
多吃纖維	☐	☐	☐
少吃飽和脂肪	☐	☐	☐
少吃鹽	☐	☐	☐
多吃生果蔬菜	☐	☐	☐
少吃防腐劑	☐	☐	☐

第三部分飲食習慣

此部份問題是有關你過去 7 天的飲食記錄。請你儘量回想過去 7 天內你吃過的所有食物(*包括所有正餐及零食*)，然後回答下列問題。（請選出適合的答案）

1. 你大部份時間在哪裡進食/購買食物？ ***(請只選一項)***

	家中/在家預備	茶餐廳/餐室/快餐店	酒樓	學校小食部/飯堂	街邊食檔/小販	麵包店	便利店/超級市場	沒有進食
早餐	☐	☐	☐	☐	☐	☐	☐	☐
午餐	☐	☐	☐	☐	☐	☐	☐	☐
晚餐	☐	☐	☐	☐	☐	☐	☐	☐

2. 在過去 7 天內，你曾光顧以下食肆多少次？

	完全沒有	一星期 1-3 次	一星期 4-6 次	每天 1 次	每天 2 次	每天 3 次	每天 4 次或以上
街邊食檔/熟食小販	☐	☐	☐	☐	☐	☐	☐
快餐店	☐	☐	☐	☐	☐	☐	☐

3. 在過去 7 天內，你吃過多少次以下食物？

食物	1 次的份量	完全沒有或少於 1 次	一星期 1-3 次	一星期 4-6 次	每天 1 次	每天 2 次	每天 3 次	每天 4 次或以上
飯、粥、粉、麵	1 碗 (250ml)							
麵包	1 片、1 個							
穀物片	1 碗 (30g)							
牛奶、乳酪	1 杯 (250ml)							
芝士	1 片							
新鮮生果 (如蘋果、橙)	1 個 (~150g)							
綠葉蔬菜 (如菜心、西蘭花)	3/4 碗 (~100g)							
其他蔬菜類(如薯仔、紅蘿蔔、豆類或瓜類)	3/4 碗 (~100g)							
糖果(包括朱古力、香口膠)	3 粒							
涼果(如果乾、肉鬆、魷魚絲)	1 包(~25g)							
薯條和薯片類零食	1 包(~35g)							
甜品(如雪糕、蛋糕、布丁、啫喱)	1 杯(~150g)							
鮮果汁、菜汁(不包括紙包果汁)	1 杯 (~250ml)							
豆奶/豆漿	1 杯 (~250ml)							
其他汽水、果汁	1 包/1 杯 (250-350ml)							
牛肉/豬肉/火腿	1 塊扒或 3 片火腿 (75g)							
雞和其他家禽	2 隻雞翼(~70g)							
香腸/午餐肉	1 條/2 片(~50g)							
蛋	1 隻							
牛油、植物牛油	1 茶匙							
沙律醬	1 茶匙							

4. 我常吃的麵包是：

- ☐ 不食麵包
- ☐ 白麵包
- ☐ 麥包
- ☐ 甜包 (如菠蘿包)
- ☐ 有餡的包 (如叉燒包、漢堡包和吞拿魚包)

5. 我常喝的牛奶是：

☐ 不喝牛奶
☐ 全脂奶
☐ 低脂奶
☐ 脫脂奶
☐ 朱古力奶
☐ 花奶、淡奶
☐ 煉奶

6. 在吃雞和其他家禽時，我會不吃皮嗎？

☐ 常常
☐ 有時
☐ 甚少
☐ 不會
☐ 看情況 (請註明：_____)

7. 你每星期參與多少次有氧運動(即一些排汗量及呼吸量大的運動，如籃球、足球、跑步、游泳等)達 20 分鐘或以上？

_____次

8. 在過去 2 星期內，你平均每天吸多少支煙？

☐ 0 支
☐ 每天少於 1 支
☐ 每天 1 支
☐ 每天 2-5 支
☐ 每天 6-10 支
☐ 每天 11-20 支
☐ 每天 20 支或以上

9. 在過去 2 星期內，你平均每天飲多少次酒 (每次 1 杯)？

☐ 0 次
☐ 少於 1 次
☐ 1-2 次
☐ 3-5 次
☐ 6-9 次
☐ 10 次或以上

10. 請問你有沒有因爲任何原因(如疾病、宗教、想身材苗條、節省金錢等)而長期 (多於兩星期)採取*特別的飲食*(如吃素、節食、不吃蝦蟹等)？

☐ 沒有
☐ 有 (請註明原因：_____)

最後，我們想問一些有關你的個人資料

香港身份證號碼 (首 6 個位)　(字母) |___|___|___|___|___|___|

性別：男 / 女

年齡_____

身高_____米　或　____尺____寸

體重_____公斤　或　_____磅

（請圈出適合的答案）

父親的教育程度：　沒有受過正式教育　小學　中學　大專或以上　不知道

母親的教育程度：　沒有受過正式教育　小學　中學　大專或以上　不知道

是否與父母同住？　是　只與父親同住　只與母親同住　沒有與父母同住

父親的職業:　失業　退休　去世　不知道

_____

母親的職業:　家庭主婦　失業　退休　去世　不知道

_____

謝謝你寶貴的資料和合作！

Appendix E: Translation of the questionnaire used in the study at baseline and follow-up

Health Concerning Club survey

Section one: Please choose the most appropriate number representing your agreement to the listed sentences (there is no standard answer)

		Strongly disagree	Disagree a little	No opinion	Agree a little	Strongly agree
1.	I am interested in knowing more about nutrition.	1	2	3	4	5
2.	I have got no time to care about my eating.	1	2	3	4	5
3.	Choosing the food I eat is my responsibility.	1	2	3	4	5
4.	I'll worry about the way I eat when I'm older.	1	2	3	4	5
5.	I have control over my snacks.	1	2	3	4	5
6.	Good eating habit is too much bother.	1	2	3	4	5
7.	I am healthy; I don't need to worry about what I eat.	1	2	3	4	5
8.	When I eat too much junk food (like potato chips and soft drinks), I don't feel good.	1	2	3	4	5
9.	Knowing more about the food I eat is eat is important to me.	1	2	3	4	5
10.	If I am careful about the way I eat now, I will be healthier when I am older.	1	2	3	4	5
11.	I can acquire healthy eating habit.	1	2	3	4	5
12.	I feel satisfied when I eat right.	1	2	3	4	5
13.	I really don't care what is in the food I eat.	1	2	3	4	5
14.	I tried going on a diet to lose weight in the past year.	1	2	3	4	5
15.	I'm not satisfied with my recent body shape and weight.	1	2	3	4	5
16.	I would acquire healthy eating habit.	1	2	3	4	5

Section two: This is a survey about nutrition knowledge, not a test. Please complete it as you can. If you do not know the answer, mark "not sure".

2.1 Advice from nutrition experts

1. Do you think health experts recommend that people should be eating more, the same amount, or less of these foods? (tick one box per food)

	More	Same	Less	Not sure
Vegetables	❑	❑	❑	❑
Sugary foods	❑	❑	❑	❑
Starchy foods	❑	❑	❑	❑
Fatty foods	❑	❑	❑	❑
High fibre foods	❑	❑	❑	❑
Fruit	❑	❑	❑	❑

2.2 Comparisons of nutrients

2. Which of the following food is rich in iron?
   - ☐ Carrot
   - ☐ Spinach
   - ☐ Strawberry
   - ☐ Fish
   - ☐ Not sure

3. Which of the following food is rich in iodine?
   - ☐ Fish
   - ☐ Broccoli
   - ☐ Beef
   - ☐ Milk
   - ☐ Not sure

4. Do you think these are high or low in fat?

	High	**Low**	**Not sure**
Luncheon meat	❑	❑	❑
Honey	❑	❑	❑
Nuts	❑	❑	❑
Bread	❑	❑	❑
Potato chips	❑	❑	❑

5. Do you think these are high or low in salt?

	High	Low	Not sure
Sausage	❑	❑	❑
Canned soup	❑	❑	❑
Cheese ball	❑	❑	❑
Potato chips	❑	❑	❑
Cracker	❑	❑	❑

6. Do you agree that there is more protein in a glass of whole milk than in a glass of skimmed milk?

☐ Agree
☐ Disagree
☐ Not sure

7. Which of these breads contain the most vitamins and minerals?

☐ White bread
☐ Wheat bread
☐ Whole-wheat
☐ Not sure

8. Do you think these are high or low in fibre?

	High	Low	Not sure
Banana	❑	❑	❑
Egg	❑	❑	❑
Beef or pork	❑	❑	❑
Broccoli	❑	❑	❑
Fish	❑	❑	❑

2.3 Choosing everyday foods

Please answer what is being asked and not whether you like or dislike the food! For example:
"If a person wanted to cut down on fat, which milk would be best to drink?"

a *Whole milk* ❑
b *Low-fat milk* ❑
c *Skimmed milk* ❑

If you didn't *like* skimmed milk, but knew it was the right answer, you would still tick skimmed milk.

9. Do you think these are healthy way for reducing weight?

	Healthy	Unhealthy	Not sure
Doing three times of exercise a week	❑	❑	❑
Chewing slowly when eating	❑	❑	❑
Eating only fruit for breakfast and lunch	❑	❑	❑
Skipping breakfast	❑	❑	❑
Not eating starchy food	❑	❑	❑

10. Do you think the following statements about anorexia nervosa are correct?

	Correct	Incorrect	Not sure
Anorexia nervosa can leads to malnutrition, losing hair, heart disease and suicidal problem	❑	❑	❑
Anorexia nervosa means people are unwilling to eat because of the fear of becoming fat, leading to continuous weight loss	❑	❑	❑

11. Which of the following saying about fast food eating is correct?
    - ☐ Too little carbohydrates
    - ☐ Too little salt
    - ☐ Too little fat
    - ☐ Too little dietary fibre
    - ☐ Not sure

12. Which would be the best choice for a low fat, high fibre lunch?
    - ☐ Roast chicken
    - ☐ Whole-wheat sandwiches with cheese
    - ☐ Whole-wheat sandwiches with beans
    - ☐ Vegetable salad with dressing
    - ☐ Not sure

13. If a person wanted to reduce the amount of fat in one's diet, which would be the best choice?
    - ☐ Roast beef steak
    - ☐ Roast sausage
    - ☐ Roast chicken breast
    - ☐ Roast pork chop
    - ☐ Not sure

14. If a person wanted to reduce the amount of salt in their diet, which would be the best choice?
    - ☐ Beef pizza
    - ☐ Preserved squid spread and smoked pig leg
    - ☐ Mushroom omelette
    - ☐ Chinese cabbage with oyster sauce
    - ☐ Not sure

2.4 Health problems or diseases

15. Are you aware of any major health problems or diseases that are related to too much fat intake? If yes, please state the related health problem(s) or disease(s)?

☐ Yes
☐ No
☐ Not sure

If yes, what diseases or health problems do you think are related to fat?

✍ _____

_____

_____

16. Do you think the followings help preventing heart disease?

	Yes	No	Not sure
Eating more fibre	❑	❑	❑
Eating less saturated fat	❑	❑	❑
Eating less salt	❑	❑	❑
Eating more fruit and vegetables	❑	❑	❑
Eating less preservatives/ additives	❑	❑	❑

Section three: Dietary and health behaviours

The following questions ask about your food intake during the past 7 days. Please recall any regular meals or snacks you had.

1. Where did you get your meals for most of the time? (tick one box per meal)

	Prepared at home	Deli/ café/ fast food stores	Restaurants	School	Street food vender	Bakery	Convenient stores/ supermarkets	Did not eat
Breakfast	❑	❑	❑	❑	❑	❑	❑	❑
Lunch	❑	❑	❑	❑	❑	❑	❑	❑
Dinner	❑	❑	❑	❑	❑	❑	❑	❑

2. During the past 7 days, how often did you purchase food at the following food stores?

	0 times	1-3 times in 7 days	4-6 times in 7 days	Once a day	Twice a day	3 times a day	4 or more times a day
i) Street food vender	❑	❑	❑	❑	❑	❑	❑
ii) Fast food stores	❑	❑	❑	❑	❑	❑	❑

3. During the past 7 days, how often did you eat the following food items?

Food	Serving every time	0 times	1-3 times in 7 days	4-6 times in 7 days	Once a day	Twice a day	3 times a day	4 or more times a day
Rice, congee or noodles	1 bowl (250ml)							
Bread	1 slice							
Cereal flakes	1 bowl (30g)							
Milk or yoghurt	1 cup (250ml)							
Cheese	1 slice							
Fresh fruit such as apple and orange	1 medium apple (~150g)							
Green leafy vegetables such as Chinese cabbage and broccoli	3/4 bowl (~100g)							
Other vegetables such as potato, carrot, bean or melon	3/4 bowl (~100g)							
Candies including chocolate and chewing gums	3 candies							
Chinese-styled snack such as dried fruits, dried meat or squid	1 small pack (~25g)							
Potato chips or similar snacks	1 small pack (~35g)							
Dessert such as ice-cream, cake, pudding or jelly	1 cup (~150g)							
Fresh fruit juice or vegetable juice (not including fruit-flavoured sugary drinks)	1 cup (~250ml)							
Soya milk	1 cup (~250ml)							
Other soft drink or sugary drink	1 pack /glass (250-350ml)							
Beef/ pork/ ham	3 slices of ham (75g)							
Chicken or other poultry	2 chicken wings (~70g)							
Sausage/ luncheon meat	1 sausage or 2 slices of luncheon meat (~50g)							
Egg	1 egg							
Butter/ margarine	1 teaspoon							
Salad dressing	1 teaspoon							

4. The bread I usually eat is: (not limited to one choice)

- ☐ I don't eat bread
- ☐ White bread
- ☐ Wheat bread
- ☐ Sweet roll (such as pineapple-flavoured roll)
- ☐ Bread with stuffing (such as barbecue pork bun, hamburger or tuna bread)

5. The milk I usually drink is: (not limited to one choice)

- ☐ I don't drink milk
- ☐ Whole milk
- ☐ Low fat milk
- ☐ Skimmed milk
- ☐ Chocolate milk
- ☐ Full cream or evaporated milk
- ☐ Condensed milk

6. How frequent do I remove chicken or poultry's skin before eating?

- ☐ Always
- ☐ Sometimes
- ☐ Seldom
- ☐ Never
- ☐ Depends (please state: _____)

7. How many times per week do you participate in aerobic exercise (i.e. exercise making you sweat or breathe hard, such as basketball, soccer, running, swimming etc.) for at least 20 minutes?

_____ time(s) /week

8. During the past 2 weeks, how many cigarettes did you smoke per day on average?

- ☐ I do not smoke
- ☐ Less than 1 cigarette per day
- ☐ 1 cigarette per day
- ☐ 2-5 cigarettes per day
- ☐ 6-10 cigarettes per day
- ☐ 11-20 cigarettes per day
- ☐ 21 or more cigarettes per day

9. During the past 2 weeks, how many times did you drink alcohol per day?

- ☐ I do not drink alcohol
- ☐ Less than 1 glass
- ☐ 1-2 glass
- ☐ 3-5 glasses
- ☐ 6-9 glasses
- ☐ 10 or more glasses

10. Are you on a **special diet** (e.g. vegetarian, dieting, avoiding seafood etc.) for at least 2 weeks because of illness, religion, keeping fit, saving money or any other reasons?

- ☐ No
- ☐ Yes (Please specify:_____)

Lastly, we would like to ask some of your personal information

Hong Kong Identity Card Number (Alphabet) |_____|_____|_____|_____|_____|_____|_____|

(The first 6 digits only)

Gender: male / female

Age: _____

Height: _____m **or** _____feet _____inch

Weight: _____kg **or** _____lb

(Please circle appropriate choice)

Father's educational level	Did not receive formal education	Primary school	Secondary school	University of above	Don't know
Mother's educational level	Did not receive formal education	Primary school	Secondary school	University of above	Don't know
Do you live with your parents?	Yes	Live with father only	Live with mother only	Do not live with father or mother	
Father's occupation	_____	Unemployed	Retired	Passed away	Don't know
Mother's occupation	_____	Housewife	Un-employed	Retired	Passed away	Don't know

--Thank you very much for your time and cooperation--

Appendix F: Results of pilot test 1 and 2 of the questionnaire

Table F1: Characteristics of sample in pilot test 1(n=119)

	n	%
Gender		
Male	58	50.4
Female	57	49.6
Age		
12	24	20.3
13	35	29.7
14	41	34.7
15	11	9.3
16 or above	7	5.8
Grade		
S.1	40	33.6
S.2	40	33.6
S.3	39	32.8

Table F2: Item analysis of the knowledge section in pilot test 1(n=119)

Variable	Item difficulty (% of correct answer)	Item discrimination1 (correlation of item and section score)	Item discrimination2 (correlation of item and total score)
Section one: Dietary recommendations			
1. Do you think health experts recommend that people should be eating more, the same amount, or less of Vegetables?	87.4	0.549**	0.259**
2. Do you think health experts recommend that people should be eating more, the same amount, or less of Sugary foods?	93.3	0.384**	0.232*
3. Do you think health experts recommend that people should be eating more, the same amount, or less of starchy foods?	36.1	0.531**	0.136
4. Do you think health experts recommend that people should be eating more, the same amount, or less of fatty foods?	92.4	0.382**	0.257**
5. Do you think health experts recommend that people should be eating more, the same amount, or less of high fibre foods?	65.5	0.580**	0.343**
6. Do you think health experts recommend that people should be eating more, the same amount, or less of fruit?	84.9	0.461**	0.220*
Section two: Sources of nutrients			
7. Which of the following food is rich in iron?	28.4	0.388**	0.343**
8. Which of the following food is rich in iodine?	21.8	0.331**	0.315**
9. Do you think luncheon meat is high or low in fat?	85.7	0.422**	0.361**
10. Do you think honey is high or low in fat?	35.3	0.430**	0.381**
11. Do you think nuts are high or low in fat?	34.5	0.236**	0.262**
12. Do you think bread is high or low in fat?	82.4	0.454**	0.409**
13. Do you think potato chip is high or low in fat?	88.2	0.450**	0.406**
14. Do you think sausage is high or low in salt?	55.5	0.516**	0.454**
15. Do you think canned soup is high or low in salt?	67.2	0.398**	0.348**
16. Do you think cheese ball is high or low in salt?	74.8	0.541**	0.539**
17. Do you think potato chip is high or low in salt?	82.4	0.545**	0.506**
18. Do you think cracker is high or low in salt?	44.5	0.474**	0.461**
19. Do you agree that there is more protein in a glass of whole milk than in a glass of skimmed milk?	31.1	0.335**	0.303**

20. Which of these breads contain the most vitamins and minerals?	52.9	0.511**	0.509**
21. Do you think banana is high or low in fibre?	58.8	0.505**	0.488**
22. Do you think egg is high or low in fibre?	44.5	0.590**	0.558**
23. Do you think beef or pork is high or low in fibre?	55.5	0.566**	0.535**
24. Do you think broccoli is high or low in fibre?	73.1	0.642**	0.622**
25. Do you think fish is high or low in fibre?	42.0	0.419**	0.406**
Section three: Choosing everyday foods			
26. Do you think doing three times of exercise a week is a healthy way for reducing weight?	93.3	0.275**	0.207*
27. Do you think chewing slowly when eating is a healthy way for reducing weight?	80.7	0.454**	0.223*
28. Do you think eating only fruit for breakfast and lunch is a healthy way for reducing weight?	84.0	0.362**	0.270**
29. Do you think skipping breakfast is a healthy way for reducing weight?	94.1	0.441**	0.356**
30. Do you think avoid eating starchy food is a healthy way for reducing weight?	84.9	0.513**	0.387**
31. Do you think the statement 'anorexia nervosa can leads to malnutrition, losing hair, heart disease and suicidal problem' is correct?	43.6	0.380**	0.287**
32. Do you think the statement 'anorexia nervosa means people are unwilling to eat because of the fear of becoming fat, leading to continuous weight loss' is correct?	60.3	0.466**	0.310**
33. Which of the following saying about fast food eating is correct?	36.1	0.328**	0.438**
34. Which would be the best choice for a low fat, high fibre lunch?	42.0	0.277**	0.171
35. If a person wanted to reduce the amount of fat in his/her diet, which would be the best choice?	47.9	0.323**	0.216*
36. If a person wanted to reduce the amount of salt in their diet, which would be the best choice?	42.0	0.394**	0.341**
Section four: Diet-disease relationship			
37-38. Are you aware of any major health problems or diseases that are related to too much fat intake? If yes, please state the related health problem(s) or disease(s)?	28.6(non-zero)	0.630**	0.290**
39. Do you think eating less saturated fat help prevent heart disease?	57.7	0.767**	0.440**
40. Do you think eating less salt help prevent heart disease?	62.8	0.713**	0.383**
41. Do you think eating more fruit and vegetables help prevent heart disease?	84.6	0.631**	0.417**

**Correlation is significant at the 0.01 level (2-tailed). Correlation is significant at the 0.05 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed).

Table F3: Item analysis of the attitude section in pilot test 1(n=119)

	Variable statement	Item discrimination1 (correlation of item and total score)	Item discrimination2 (correlation of item and section score)	Internal reliability (Cronbach's alpha)
Section one: Positive view towards healthy eating				
1.	Learning about nutrition is interesting to me.	0.554**	0.531**	
2.	I am too busy to worry about what I eat.	0.400**	0.497**	
3.	Good eating habit is too much bother.	0.506**	0.623**	0.5670
4.	When I eat too much junk food, I don't feel good.	0.214*	0.435**	
5.	If I am careful about the way I eat now, I will be healthier when I am older.	0.648**	0.679**	
6.	I feel good when I eat right.	0.663**	0.679**	
Section two: Self-responsibility of healthy eating				
7.	Choosing the food I eat is my responsibility.	0.283**	0.462**	
8.	I'll worry about the way I eat when I am older.[+]	-0.448**	-0.147	
9.	I am healthy; I don't need to worry about what I eat.	0.271**	0.538**	0.2203
10.	Knowing more about the food I eat is important to me.	0.634**	0.649**	
11.	I really don't care what is in the food I eat.	0.561**	0.610**	
12.	I would acquire healthy eating habit.	0.608**	0.562**	
Section three: Real power of acquiring healthy eating habit				0.5675
13.	I have control over my snacks.	0.601**	0.853**	
14.	I can acquire healthy eating habit.	0.630**	0.818**	
Section four: Perspective of weight control				
15.	I used dieting to lose weight in the past year[++]	0.376**	0.101	0.5745
16.	I am not satisfied with my recent body shape and weight[+++]	0.332**	0.071	
			Overall internal reliability:	0.6921

** Correlation is significant at the 0.01 level (2-tailed). Correlation is significant at the 0.05 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

[+] Item was revised and retested, giving an item-to-section-score correlation of 0.287 and an item-to total-score correlation of 0.424.

[++] Item was revised and retested, giving an item-to-section-score correlation of 0.0.837 and an item-to total-score correlation of 0.263.

[+++] Item was revised and retested, giving an item-to-section-score correlation of 0.869 and an item-to total-score correlation of 0.336.

Table F4: Test-retest reliability of eating behaviour section in pilot test 2 (n=78)

	Item	Pearson's correlation	Kappa
1.	Where do you have breakfast mostly during the day?	0.917***	0.917***
2.	Where do you have lunch mostly during the day?	0.840***	0.823***
3.	Where do you have dinner mostly during the day?	1.000***	1.000***
4.	During the past 7 days, how many times did you go to food stall/ hawker?	0.557***	0.551***
5.	During the past 7 days, how many times did you go to the fast food shop?	0.424***	0.424***
6.	During the past 7 days, how many times did you consume Chinese dried snacks?	0.685***	0.671***
7.	During the past 7 days, how many times did you eat fried snacks like chip and french-fried?	0.618***	0.618***
8.	During the past 7 days, how many times did you eat desserts like pudding, cake and jelly?	0.475***	0.475***
9.	During the past 7 days, how many times did you consume other sugary or carbonated drinks?	0.634***	0.629***
10.	During the past 7 days, how many times did you consume sausage and luncheon meat?	0.470***	0.467***
11.	During the past 7 days, how many times did you consume egg?	0.641***	0.636***
12.	During the past 7 days, how many times did you consume butter or margarine?	0.578***	0.572***
13.	During the past 7 days, how many times did you consume salad dressing?	0.695***	0.687***
14.	During the past 7 days, how many times did you consume candy?	0.659***	0.649***
15.	During the past 7 days, how many times did you consume bread?	0.736***	0.733***
16.	During the past 7 days, how many times did you drink milk and yoghurt?	0.756***	0.744***
17.	During the past 7 days, how many times did you consume cereal flakes?	0.470***	0.462***
18.	During the past 7 days, how many times did you eat fruit?	0.645***	0.642***
19.	During the past 7 days, how many times did you eat green vegetables?	0.378**	0.377**
20.	During the past 7 days, how many times did you eat other vegetables?	0.456***	0.456***
21.	During the past 7 days, how many times did you drink 100% fruit juices?	0.608***	0.606***
22.	During the past 7 days, how many times did you consume meat or ham?	0.607***	0.607***
23.	During the past 7 days, how many times did you consume chicken and other poultry?	0.588***	0.586***
24.	During the past 7 days, how many times did you consume soymilk?	0.642***	0.641***
25.	During the past 7 days, how many times did you consume cheese?	0.805***	0.787***
26.	During the past 7 days, how many times did you eat cereals?	0.373**	0.372**
27.	Which kind of bread you usually eat?	0.751***	0.699***
28.	Which kind of milk you usually drink?	0.853***	0.844***
29.	Would you remove the skin of poultry before eating?	0.932***	0.894***
30.	How many times per week do you participate in aerobic exercise up to 20 minutes?	0.972***	Cannot be computed
31.	How often you smoke cigarette per day in the past 2 weeks?	1.000***	1.000***
32.	How often you drink alcohol in the past 2 weeks?	0.813***	Cannot be computed
33.	Are you on a special diet for any reasons?	0.703***	0.661***

Appendix G: Letter of survey ethics approval

THE CHINESE UNIVERSITY OF HONG KONG

M E M O

To : Dr. Tsang Kwong Ka
Department of Community and Family Medicine

From : Secretary
Survey Ethics Committee

Ext. : 6238

Date : 19 January 2000

Survey Ethics Approval

I write to inform you that the above ethical approval has been given for you to engage in the project named below:

Project Title : Improving Healthy Eating in Hong Kong: A School Based Nutrition Education Model for Enhancing Healthy Eating Habits in Schools

Source of Funding : Health Care and Promotion Fund

Ref. No./Account Code : Unknown

Should you have any queries, please feel free to contact me.

Morris Chan

c.c. Director, Research & Technology Administration Office
Panel Secretary concerned

MC/ky

Appendix H: Qualitative progress report sample

Workshop 1—Introduction of the society and nutrition

Aim

After this lesson, the members will:	School A Achieved?	School B Achieved?
Understand the mission and targets of Health Concerning Club.	N	Y
Know the committee members and the outline of the activities schedule throughout the year.	N	N
Form base groups.	N	N
Have the opportunity to think and clarify their thinking on "eating" and "food".	partlyY	Y
Have the opportunity to measure their knowledge, attitude and behaviour towards healthy eating.	Y	Y

School A (Date of workshop1: 15 May 2000)

- They didn't voluntarily want to form groups with people they don't know, so I would assign the base groups for them in the next lesson
- 15 students wanted to be the committee members
- They didn't know how tall they are, so measured by ruler immediately
- Several students did the questionnaire and left before the lesson end
- I and Ms Mak had decided to conduct the activities on Wednesday
- Process Evaluation 1 (what do the member expect to learn from the activities and the club):
  - What is a balanced diet?
  - How to prevent "urban diseases"?
  - How to control weight?
  - The importance of health
  - How to maintain a good body shape?
  - Higher marks in biology
  - How many calories a person need a day?
  - How many calories are there in a sausage?
  - What is a healthy eating habit?
  - How to solve the problem of lacking time in maintaining a healthy lifestyle?
  - How to lose weight at one time?
  - What is/are the consequence(s) of eating only several types of food?
  - Cooking practice
  - Healthy recipe
  - How to be taller?
  - The nutrition facts of the foods
  - How can I be a dietician?

School B (Date of workshop: 22 May 2000)

- The microphone was out of order, so I needed to say loudly
- Some naughty students left the room during the lesson
- They did not want to speak out in front of the class
- The problem of discipline affected the delivery of the lesson and made the lesson overrun
- Ms Tang announced that the coming activities will be carried out on Monday
- In fact, the activity room is very nice and suitable for our activities
- Process Evaluation 1 (what do the member expect to learn from the activities and the club):

- Present
- Good figure
- Out going visits
- What is a good eating habit?
- How to be healthy?
- Nutrition information
- Spend time
- Cooperative skills
- Knowing their health condition
- Calories in food
- The importance of a well-balanced diet
- Health knowledge
- The advantage of sleeping
- How to gain muscle

Workshop 2—basic nutrients needs for people

Aim

After this lesson the members will:	**School A achieved?**	**School B achieved?**
✧ Know the six groups of food and the six essential nutrients that the body requires.	Y	Y
✧ Know which types of food contain more fat and the basic characteristics of fat.	Y	Y
✧ Begin to think the problems caused by modern diet.	Y	Y
✧ Taste different kinds of icy food.	Y	N

School A (Date of workshop: 26 Jun 2000)

- ✧ 30 members came (because it was not a regular school day, members were informed about this workshop by parent consent form and teacher's announcement only)
- ✧ The workshop started 10 minutes late
- ✧ The first ice-breaking game seemed not able to motivate them, so the leader immediately added another warm-up game (BINGO) which brought the members closer.
- ✧ The overall atmosphere was warm and interactive.
- ✧ Some AV technical problems (finally solved and did not affect the schedule).
- ✧ The leader changed the schedule to: chef cooking =>BINGO => Eating is blessing
- ✧ The response of the food tasting was good (they were surprised and the icy food tasted good).
- ✧ They were willing to filling in the base group preference form and understood the importance of the base group (better than that in Workshop1).

School B (Date of workshop: 3 July, 2000)

- ✧ Attendance was high (>40)
- ✧ The lesson started late because the projector was not ready => it made me hurry at the end
- ✧ The atmosphere was fine in 'Chef Cooking' and 'Bingo'
- ✧ Members paid attention in watching the video
- ✧ No eating is allowed the activity room, so food tasty would be rearranged in the Workhsop3
- ✧ No problem in filling in the 'base group preference form'

Appendix J: Knowledge and Attitude scores and Dietary behaviours of Intervention Group and Control Group at baseline

Table J1 Comparison of baseline knowledge scores between Intervention Group (n=83) and Control Group (n=83)

Subsection (max. score)	Intervention (mean)	Control (mean)	Mean difference	*P*-value (95% CI)
1. Dietary recommendations (6)	4.75	4.45	-0.30	0.151 (-0.71, 0.11)
2. Sources of nutrients (19)	11.75	10.92	-0.83	0.101 (-1.82, 0.17)
3. Choosing everyday foods (11)	7.40	7.22	-0.18	0.564 (-0.80, 0.44)
4. Diet-disease relationship (5)	2.36	2.46	+0.10	0.567 (-0.24, 0.43)
Overall nutrition knowledge (41)	26.25	25.04	-1.21	0.187 (-3.03, 0.60)

Table J2 Comparison of baseline knowledge scores between Intervention Group and Control Group by grade

Subsection (max. score)	Intervention (mean)	Control (mean)	Mean difference	*P*-value (95% CI)
Secondary 1				
1. Dietary recommendations (6)	4.53	4.49	-0.04	0.892 (-0.70, 0.61)
2. Sources of nutrients (19)	11.20	10.44	-0.76	0.301 (-2.20, 0.69)
3. Choosing everyday foods (11)	6.87	7.24	0.37	0.414 (-0.54, 1.29)
4. Diet-disease relationship (5)	2.29	2.38	0.09	0.681 (-0.34, 0.52)
Overall nutrition knowledge (41)	24.89	24.56	-0.33	0.817 (-3.19, 2.52)
Secondary 2				
1. Dietary recommendations (6)	5.00	4.50	-0.50	0.168 (-1.22, 0.22)
2. Sources of nutrients (19)	11.72	10.67	-1.05	0.272 (-2.97, 0.86)
3. Choosing everyday foods (11)	7.83	6.50	-1.33	***0.029*** (-2.52, -0.14)
4. Diet-disease relationship (5)	2.33	2.11	-0.22	0.585 (-1.04, 0.60)
Overall nutrition knowledge (41)	26.89	23.78	-3.11	***0.037*** (-6.01, -0.21)
Secondary 3				
1. Dietary recommendations (6)	5.00	4.30	-0.70	***0.038*** (-1.36, -0.04)
2. Sources of nutrients (19)	13.00	12.20	-0.80	0.394 (-2.68, 1.08)
3. Choosing everyday foods (11)	8.20	7.80	-0.40	0.427 (-1.41, 0.61)
4. Diet-disease relationship (5)	2.55	2.95	0.40	0.236 (-0.27, 1.07)
Overall nutrition knowledge (41)	28.75	27.25	-1.50	0.270 (-4.21, 1.21)

Table J3 Comparison of baseline attitude scores between Intervention Group (n=83) and Control Group (n=83)

Subsection (score range)	Intervention (mean)	Control (mean)	Mean difference	*P*-value (95% CI)
1. Positive view towards healthy eating (-12 to 12)	3.43	2.95	-0.48	0.335 (-1.47, 0.50)
2. Self-responsibility towards healthy eating (-12 to 12)	4.59	3.83	-0.76	0.177 (-1.86, 0.35)
3. Real power of acquiring healthy eating habit (-4 to 4)	1.08	0.95	-0.13	0.601 (-0.63, 0.37)
4. Perspective of weight control (-4 to 4)	0.87	0.65	-0.22	0.455 (-0.79, 0.36)
Overall attitude towards healthy eating (-32 to 32)	9.98	8.39	-1.59	0.154 (-3.79, 0.60)

Table J4 Comparison of attitude group between Intervention Group and Control Group at baseline

Attitude group of subsections	No. of students		Chi-square	*P*-value
	Intervention	Control		
1. Positive view towards healthy eating				
Positive	67	65	0.148	0.701
Neutral or Negative	16	18		
2. Self-responsibility towards healthy eating				
Positive	71	69	0.182	0.669
Neutral or Negative	12	14		
3. Real power of acquiring healthy eating habit				
Positive	53	53	0.000	1.000
Neutral or Negative	30	30		
4. Perspective of weight control				
Positive	46	44	0.097	0.755
Neutral or Negative	37	39		
Overall attitude towards healthy eating				
Positive	76	71	1.486	0.223
Neutral or Negative	7	12		

Table J5 Comparison of baseline attitude scores between ***Secondary two students*** in Intervention Group (n=18) and Control Group (n=18)

Subsection (score range)	Intervention Group (mean)	Control Group (mean)	Mean difference	*P*-value (95% CI)
1. Positive view towards healthy eating (-12 to 12)	4.39	2.06	-2.33	0.026 (-4.36,-0.30)
2. Self-responsibility towards healthy eating (-12 to 12)	5.72	2.28	-3.44	***0.004*** (-5.73, 1.16)
3. Real power of acquiring healthy eating habit (-4 to 4)	1.44	0.56	-0.88	0.116 (-2.01, 0.23)
4. Perspective of weight control (-4 to 4)	1.11	-0.06	-1.17	***0.013*** (-2.07,-0.26)
Overall attitude towards healthy eating (-32 to 32)	12.67	4.83	-7.86	***0.001*** (-12.32,-3.35)

Table J6 Comparison of baseline attitude scores of ***male students*** between the Intervention Group (n=16) and Control Group (n=16)

Subsection (score range)	Intervention Group (mean)	Control Group (mean)	Mean difference	*P*-value (95% CI)
1. Positive view towards healthy eating (-12 to 12)	3.31	1.86	-1.45	0.340 (-4.46, 1.59)
2. Self-responsibility towards healthy eating (-12 to 12)	6.19	3.19	-3.00	***0.019*** (-5.48,-0.52)
3. Real power of acquiring healthy eating habit (-4 to 4)	1.94	0.56	-1.38	***0.037*** (-2.66, -0.09)
4. Perspective of weight control (-4 to 4)	1.00	1.44	0.44	0.527 (-0.96, 1.83)
Overall attitude towards healthy eating (-32 to 32)	12.44	7.06	-5.38	0.092 (-11.69, 0.94)

Table J7 Comparison of selected dietary behaviours between Intervention Group and Control Group at baseline

Dietary behaviours of the seven days preceding the survey	No. of students		Chi-square	*P*-value
	Intervention	Control		
Breakfast				
Had	73	69	1.002	0.317
Skipped	7	11		
Bought food from street food vendor				
<4 times	80	80	0.000	1.000
4 times or more	3	3		
Bought food from fast-food shop				
<4 times	67	68	0.040	0.842
4 times or more	16	15		

Table J8 Comparison of the dietary behaviours of "less healthy" food between Intervention Group and Control Group at baseline

Food frequency of the seven days preceding the survey	Serving size	No. of students		Chi-square	*P*-value
		Intervention	Control		
Candies [a]	3 granules				
<4 times		47	46	0.274	0.600
4 times or more		32	37		
Chinese-styled snacks [b]	25 grams				
<4 times		65	66	0.646	0.422
4 times or more		12	17		
Potato chips or similar snacks	35 grams				
<4 times		60	56	1.784	0.182
4 times or more		18	27		
Desserts [c]	150 grams				
<4 times		55	62	0.217	0.641
4 times or more		22	21		
Carbonated or sugary drinks	250-350 millilitres				
<4 times		43	49	0.350	0.554
4 times or more		36	34		
Sausage or luncheon meat	50 grams				
<4 times		58	66	0.411	0.521
4 times or more		17	15		
Butter or margarine	5 grams				
<4 times		65	72	0.383	0.536
4 times or more		12	10		
Salad dressing	5 grams				
<4 times		71	78	0.195	0.659
4 times or more		6	5		

[a] Candies included chocolate and chewing gum.
[b] Chinese-styled snacks' examples were dried fruit, dried beef and dried squid.
[c] Desserts' examples were ice-cream, cake, pudding and jelly.

Table J9 Comparison of the consumption of food rich in carbohydrates between Intervention Group and Control Group at baseline

Food frequency of the seven days preceding the survey	Serving size	No. of students		Chi-square	*P*-value
		Intervention	Control		
Rice, congee or noodles	250 millilitres				
<4 times		12	10	0.340	0.560
4 times or more		67	73		
Bread	1 slice				
<4 times		50	57	0.689	0.407
4 times or more		30	26		
Cereal flakes	30 grams				
<4 times		66	73	0.964	0.326
4 times or more		14	10		

Table J10 Comparison of the consumption of fruits and vegetables between Intervention Group and Control Group at baseline

Food frequency of the seven days preceding the survey	Serving size	No. of students		Chi-square	*P*-value
		Intervention	Control		
A. Green vegetable [a]	3/4 bowl				
<1 time per day		22	25	0.101	0.750
≥1 time per day		57	58		
B. Other vegetable [b]	3/4 bowl				
<1 serving per day		46	58	2.091	0.148
≥1 servings per day		32	25		
C. Total vegetable count (A+B)	3/4 bowl				
<3 servings per day		61	69	0.401	0.526
≥3 servings per day		16	14		
D. Fruit [c]	1 medium size fruit				
<2 servings per day		66	72	0.149	0.699
≥2 servings per day		12	11		
E. Total fruit and vegetable count (C+D)					
<5 servings per day		67	74	0.039	0.843
≥5 servings per day		9	9		

[a] Green vegetables' examples were cabbage and broccoli.

[b] Other vegetables' examples were potato, carrot, legumes and melons.

[c] Fruits' examples were apple and orange.

Table J11 Comparison of the consumption of "healthy" beverages between Intervention Group and Control Group at baseline

Food frequency of the seven days preceding the survey	Serving size	No. of students		Chi-square	*P*-value
		Intervention	Control		
Fresh fruit juice or vegetable juice [a]	250 millilitres				
<4 times		66	69	0.005	0.944
4 times or more		13	14		
Milk or yoghurt	250 millilitres				
<1 time per day		70	68	0.974	0.324
1 or more time per day		10	15		
Soya milk	250 millilitres				
<4 times		62	72	1.518	0.218
4 times or more		16	11		

[a] Fresh fruit juice didn't included fruit-flavoured sugary drink.

Table J12 Comparison of the milk choice between Intervention Group (n=68[a]) and Control Group (n=69) at baseline

Type of milk usually chose	No. of students		Chi-square	*P*-value
	Intervention	Control		
Low fat or fat-free	30	22	2.177	0.140
Whole, chocolate, full cream evaporated or condensed	38	47		

[a] n refers to the number of students who would drink milk.

Table J13 Comparison of the frequency of removing poultry's skin before eating between Intervention Group and Control Group at baseline

Frequency of removing poultry's skin before eating	No. of students		Chi-square	*P*-value
	Intervention	Control		
Always	22	19	0.398	0.528
Sometimes, seldom or never	59	64		